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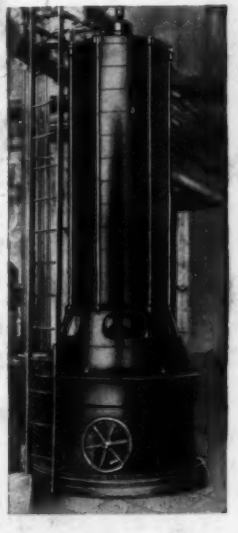
# THE PAPER INDUSTRY

A MONTHLY EDUCATIONAL JOURNAL AUGUST, 1933


## Making Uniform Stock



PAPER stock prepared in an ordinary beater, by the batch method, does not constantly produce a uniform sheet.

Stock prepared in a Fritz Vertical Refining and Hydrating Machine is always uniform, because it passes through the machine continuously under uniform conditions.

Uniformity of treatment is only one of several advantages gained through the use of this machine.

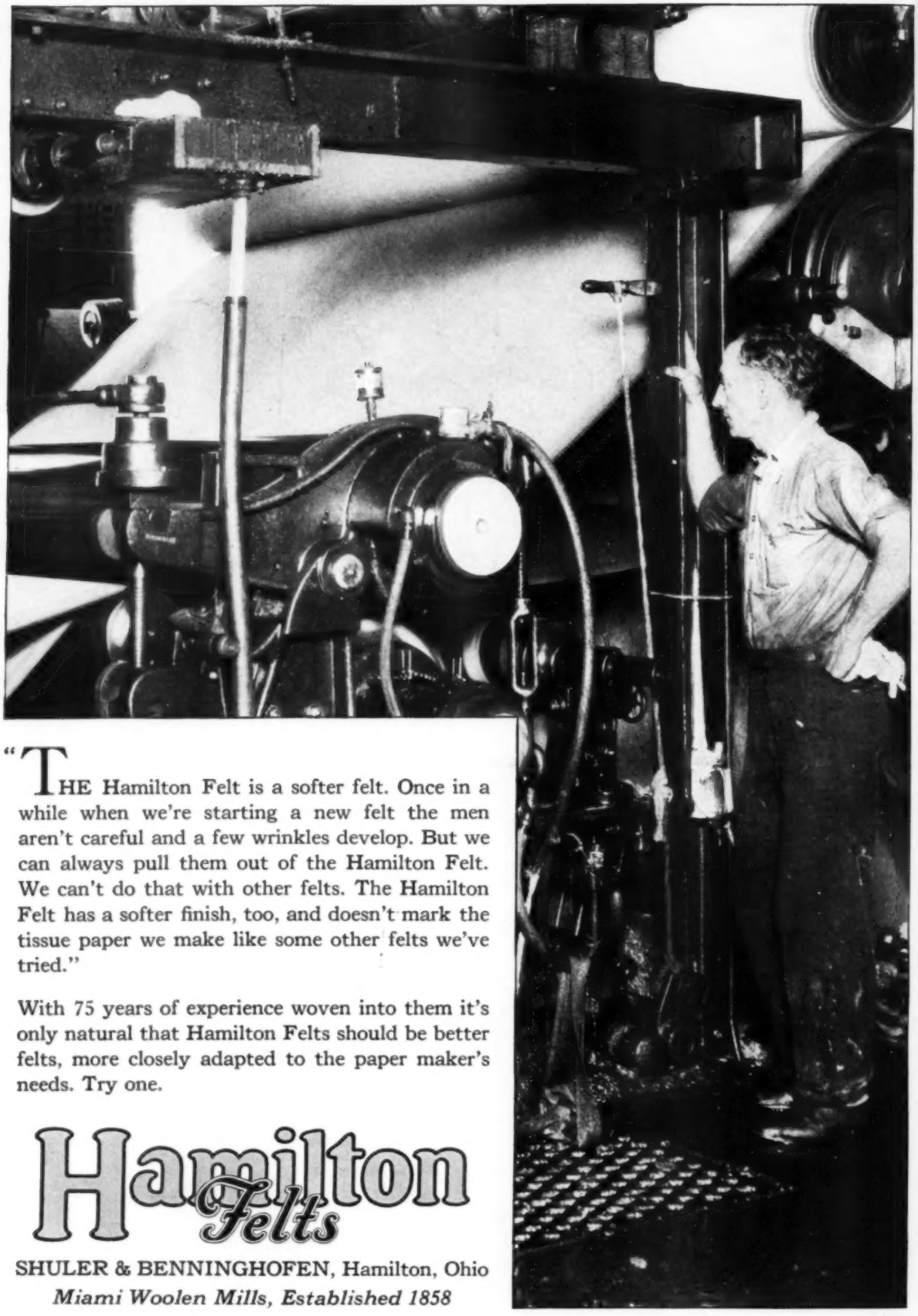
Taken collectively, these advantages result in *Better Paper at Lower Costs.*

If you want to achieve such an accomplishment, consult us.

◆ ◆ ◆

**LOVE BROTHERS, Incorporated**

**Aurora, Illinois**



"THE Hamilton Felt is a softer felt. Once in a while when we're starting a new felt the men aren't careful and a few wrinkles develop. But we can always pull them out of the Hamilton Felt. We can't do that with other felts. The Hamilton Felt has a softer finish, too, and doesn't mark the tissue paper we make like some other felts we've tried."

With 75 years of experience woven into them it's only natural that Hamilton Felts should be better felts, more closely adapted to the paper maker's needs. Try one.

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*Miami Woolen Mills, Established 1858*

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NEW BIRKS BLDG., MONTREAL

ROSS SYSTEMS
HEATING—VENTILATING—DRYING

# THE PAPER INDUSTRY

AUGUST, 1933
Vol. XV—No. 5

A MONTHLY EDUCATIONAL JOURNAL
Devoted to the Interests of the Pulp and Paper Industry


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EDWARD B. FRITZ, Publisher

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In Tannate Belts pliability, strength, grip and durability **are combined** in an unusual degree.

# RHOADS TANNATE LEATHER BELTS

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# *Here's the way* TO ASSURE HIGH QUALITY PULP *at lowest cost*

*An unusually fine picture of the Taylor Temperature Recording Regulator in action on a Caterpillar Type Grinder. A tough job—but the Taylor System licked it.*

**Taylor Recording Regulator automatically keeps this Caterpillar type grinder running at normal temperatures**

WHAT ordinarily would be a tough job is remarkably easy for a Taylor System of Grinder Temperature Control. Whether it's keeping grinder temperature normal on a caterpillar type grinder (as above), or on pocket or magazine types, it's all the same to a Taylor System. This Control is one of the best money-saving investments mills have made. They have said so themselves.

You need correct grinding temperatures to produce maximum tonnage of high-quality stock at a low cost per ton, don't you? Right. Also to assure uniform stock, texture, color and freeness, the greatest fiber strength, and correct felting characteristics. And to lengthen stone life and save reburring and replacement costs.

Then, look to the Taylor Control of Grinder Temperatures to maintain that correct temperature automatically. It's a simple system—practical and always reliable. It has been an economical and profitable investment wherever installed in United States and Canadian mills.

Business is looking up. But perhaps you are still looking for ways to cut costs further and increase pulp quality. Then put Taylor Automatic Grinder Temperature Control in your mill tomorrow, if you don't have it now.

For more details, write Taylor Instrument Companies, Rochester, N. Y., or Taylor Instrument Companies of Canada, Ltd., Toronto, Canada.

Tycos Taylor

Indicating / Recording • Controlling

TEMPERATURE *and* PRESSURE INSTRUMENTS

*The name Taylor now identifies our complete line of products, including Tycos instruments.

# MODERNIZE TO ECONOMIZE

**Meet the present day demand for operating efficiency with**

**TESTED IMPROVEMENTS . . . . .**

**CRODON**
*The Chrome Plate*

***FOR . . . .*** *reduced maintenance costs*
*cleaner and better products*
*longer equipment life*
*freedom from corrosion*
***. . . . . thorough satisfaction!***

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CRODON-plated PRESS ROLLS
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**Performance data upon request.**
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| Waterbury, Conn. | Cleveland, Ohio | Chicago, Ill. | Milwaukee, Wis. |

# Support the Industrial Recovery Act

THE time of theorizing and debating the Industrial Recovery Act and the probable effect of industrial codes upon business has passed.

Some five hundred codes are already filed and hundreds more are being received daily—and they should be.

We are facing facts. The "new deal" is actively operating. It constitutes the only plan for industrial recovery before the people. It is here to operate, and, in our judgment, it will operate to the benefit of the whole country.

In place of fifty million diverse ideas and leaderships, we have today one dominant plan and one powerful, intelligent leader pushing instantly and effectively for industrial recovery. A well thought-out plan administered by a resourceful and confident leader has every chance for success, since success lies in action and action is the preëminent earmark of today.

Of course, it is an amazing and astounding situation, but we can stand a lot of amazing happenings provided benefits and improvements are resulting. And who in this country today cannot testify to the improvement in general country-wide conditions when contrasted with conditions existent six months ago?

Had any one, no matter how exalted his standing as an industrial authority, predicted five months ago the change that has actually taken place, he would have been dubbed an arrant optimist, unworthy of credence. "It just couldn't be done!" That was the conviction of one hundred millions of people, worn to a frazzle with four and one-half years of devaluation and inactive drifting to the precipice of bankruptcy.

But, it has been done. The impossible has been converted into a revaluation fact. Confidence has returned. An enthusiasm for successful living has been restored. An overwhelming majority of the population is okeying "We do our part"—it is all wrapped up in the Industrial Recovery Plan.

That plan ***must*** and ***will*** succeed.

There is no other plan of salvation before us.

After all, what is the Industrial Recovery Act?

Nothing but another way of saying that industry shall operate at a profit, and the Act provides the specifications for insuring those profitable operations.

The Government of the country naturally takes the lead in the march of industry back from deficit operations to profitable operations, for the Government is no different from any other corporation, and unless it can secure money to pay for its necessary operations, it must fail.

The Government must gets its money in the form of taxes on profits, not from deficits.

Hence, the move to eliminate unfair industrial practices which make profits unobtainable. No more exploitation of labor for competitive purposes. No more selling commodities below cost of production. No more rebates secret, direct or indirect.

Oh, yes, we know it is a big job, and the authors of the plan realize that cleaning the Augean Stables was just a bit of child's play compared to this stupendous plan of lining up a stubborn, wilful, perverse industry back of a truce on selfishness.

Abolish selfishness?

"Never can be done," say our purblind operators. We agree with them, yet go further by saying that

we never want selfishness to be abolished. We do, however, want the right brand of selfishness—that enlightened, intelligent, constructive self-interest, which insists on good profits and the acquisition of all other good things for himself and insists equally that his neighbor and brother share the same also.

Line up actively behind the Industrial Recovery Act, for to do so is to live and let live.

## Yesterday and Tomorrow

HOW many pulp and paper mills that are in operation today will be producing pulp and paper fifty years from today? How many of these mills will then be functioning as some type of industrial enterprise? These questions and a number of others came to mind upon the examination of an equipment catalogue published about fifty years ago by a firm selling to the pulp and paper industry—a firm, by the way, that is still one of the leaders in its field.

Within the pages of that catalogue were listed a number of pulp and paper mill customers with their addresses. By comparing this list of mills with the names and addresses of firms of today it was noted that many of the mill towns or cities listed in the old catalogue are not now even associated with the pulp and paper industry other than perhaps as possible consumer markets. A few of the mills were readily recognized from the names of firms in operation at present. In some cases, the towns in which the plants were located have either passed out of existence or have become tired of the name and have taken a new one.

What caused the decadence of these various enterprises and in some cases even the towns in which they were located? Was the failure due to poor location, or was it due to the loss of an individual or perhaps of a few individuals who were responsible for bringing each of the various plants into existence and then expending all of their energies in making such enterprises successful? Were the individual failures simply the result of natural economic changes, or is a business built today only to die tomorrow?

Cannot we in some measure apply the old simile that history repeats itself? Is not the same thing true of units of industry that has been true of nations; namely, a rise and fall; or, more concretely, is the life of a business wrapped so closely with those who create it that it must die with them? Has there not been a lack of vision on the part of the builders to prevent collapse of the enterprises which they so nobly created as soon as they have passed from the picture?

Can it be assumed that when each of the decadent firms began business that it was to fill a need? Surely vision was required to bring each of these businesses into being. Did they, however, through the years continue to have at their helm men with foresight and courage to guide them through periods of prosperity or lulls in the trade? Such questions and still others came to mind as possible reasons for failure, but such is all in the past.

Will the next fifty years reveal changes similar to those recorded during the past half century?

## Vacations

NO MATTER how much one tries to avoid it, the routine and grind of daily work is apt to make him a part of a complex machine with certain duties to perform within certain time intervals. Although such routine may increase man's capability for work, just as certain physical exercises will develop certain muscles, it also creates fatigue and, if overdone, may exceed the elastic limit of one's endurance.

The value of a vacation or a change from the regular routine of work has long been recognized. In fact, there is an adage of long standing that "All work and no play makes Jack a dull boy." It is necessary for everyone at times to get away for a short while from the work which sometimes all but engulfs him, and to do something entirely different.

It is not so much a question of rest as it is a change. The traveling man who is away from home a large part of the time, may enjoy his vacation by staying at home. The office or plant executive may find it helpful to forget business and to go away. Wherever one goes, or whatever one does, must of necessity depend upon individual circumstances.

The change, however, should be invigorating and revitalizing. Sufficient time should be granted to make this influence effective. Then when the vacationist is back on the job again, this influence should be manifest in greater powers of concentration, greater originality, greater speed in handling details of the job, and in numerous other ways.

Try to get the most out of your vacation if you have not already enjoyed it.

◆ THE HOMELY old maxim that "a chain is no stronger than its weakest link" might well be applied to the paper mill as an organization. No organization can be stronger than the body of men that constitutes it. Check up on your organization. Find its weak point. Strengthen it so that should adversity come, you will be in position to put up a good fight and win if it is in the cards to do so.

# *To* MILL EXECUTIVES *who have* Plans *to meet the* Challenge *of* Low Prices

MODERNIZING or making over present paper machines to take fine paper orders at a profit requires careful planning. Plans laid before S & W engineers are kept confidential, receive benefit of the longest experience in this country on fine paper making machinery, and involve no obligation. Write, South Windham.

★ "Carrying the Torch" gives facts on S & W mill machinery, outlines the machines mentioned at the right and tells how even before installation ability to do the work required was guaranteed. Write for your free copy.

THE *two widest Fourdriniers in the world for making at lowest cost the finest tissue and condenser papers are Smith & Winchester designed and built.*

★

# *The* SMITH & WINCHESTER
## *Manufacturing Company*

6

PLANT AND OFFICES AT SOUTH WINDHAM, CONNECTICUT

# Let's Advertise

By WILLIAM SIBLEY

BACK in the gold-plated days of 1928 I suggested in these pages that the paper industry, through its association, undertake a campaign of advertising to make the American public paper conscious. The suggestion was good at that time. It is infinitely more timely now.

Before we get turned around it will be 1934. And 1934, from all present indications, will be a year of considerable prosperity. The farmers will have more money to spend; unemployment will be lower; conditions in general promise to be vastly improved over those of the past four years. But if we, as an industry, are going to prosper, we will have to work for what we get. The Industrial Recovery Act and other measures of governmental supervision, if not control, will not in themselves perform miracles. A similar act in England failed after several years of effort and the establishment of more than one hundred and fifty bureaus. Whether or not it works here depends entirely upon us—not the Government. We must go after what we get, and the reason we are not getting more paper tonnage is because we do not go after it except perhaps by the destructive means of cutting prices. One of the main reasons why we do not sell more paper is because people do not know how to use it. If they did, they would buy more of it.

Frankly, about handkerchiefs—and the need for the development of a reliable, worthy paper substitute for the germ-harboring linen—evidence that this is a pertinent matter is found in the fact that already many women are abandoning linen handkerchiefs in favor of certain tissues. For the mill that makes these tissues (along with other products) to undertake the educational advertising such a product needs would mean a seriously unbalanced advertising budget. Should not this job be one for the association to undertake? Would not the results of the association's activity far exceed the results of the several individuals?

That same association of paper and pulp manufacturers should also undertake the educational job of promoting a more general use of paper insulating materials for the hundreds of thousands of small homes which are going to be built during 1934 and 1935. A few dollars spent for insulating materials at the time of home construction will save hundreds of dollars in future fuel bills. People know this in a general sort of way. But this sort of knowledge results in about one-half the tonnage that might be sold.

There are more than twenty million housewives and cooks in this country who need to be told over and over again the convincing story of food-flavor conservation and nutritive value that comes through the use of paper in cooking. The potential market for such a product is almost beyond comprehension.

A portion of the association's advertising campaign might well be directed toward educating people to keep daily records of their personal activities. Not diaries—kill that word "diary." To the majority of people, a diary means some little book in which a sixteen-year old girl jots down her mental meanderings. But a daily record of personal activity—that's another matter, and frequently a very necessary one. Why shouldn't all of us keep records of what we do and whom we see each day? No reason aside from the reluctance to establish a habit. And many, many reasons why we should. There is business here for the paper industry.

In my personal circle of friends there are no less than five housewives who take the pains to spread newspapers over the clothes hanging in the wardrobe. That takes time, patience and pins—and doesn't do a very efficient job. Since the market now affords a number of different kinds of coat-hanger sacks, doesn't it seem that these items should be exploited, not only by the individual makers, but by the association as one of the multitudinous uses for paper?

It is not suggested that the business resulting from these few items would provide sufficient tonnage to justify the institution of an industrial co-operative advertising campaign. They are cited merely to indicate the need for public education; the need for the industry as a whole to tell the American people how, when and where—not to speak of why—to use paper.

There is little or no universal appreciation of the fact that as a nation we are utterly dependent upon paper for our well-being. Let some cataclysmic disaster suddenly wipe out of existence all paper and all paper and pulp plants, and this nation would stand still, so to speak. And presently we would all be out on the soil trying to scratch a bare sustenance from Mother Earth until such time as more paper had been made and distributed. The people of this country are not paper conscious in the sense they are conscious of electricity, automobiles, clothes or cosmetics.

And, by the same token, there seems to be little or no inter-industrial appreciation of the need for, or value of, a campaign to make the American people appreciative and more receptive of our product. When we as an industry come to realize that more may be gained through a co-operative advertising campaign than through ten Industrial Recovery Acts, we shall perhaps have such a campaign. May that appreciation come soon.

# why *THEY* like Link-Belt Silent Chain

# *who?* . . . . THE USERS

## And here are some of the reasons:

**1.** Transmits full R.P.M. of motor. The action is always positive . . . tooth to tooth action as in gears.

**2.** Yet is Flexible as a Belt (or Ropes). But there can be no slippage between wheels and driving medium. Power "slipped away" is power lost, and money wasted.

**3.** Runs slack, reducing bearing friction to minimum. Power used for overcoming needless friction is power wasted . . . money lost.

**4.** Is unaffected by atmospheric changes, and does not deteriorate when standing idle. Can be used in hot or damp places.

**5.** Operates on long or short centers. The short-center drive saves money all around. Less floor space . . . less driving medium. The centers can readily be changed.

**6.** Reductions of speed up to 15 to 1 are entirely practicable.

**7.** No other form of drive combines such dependability, durability, flexibility and positive action, with a minimum of attention to lubrication and maintenance. Many Link-Belt Silent Chain Drives have been running 10, 15, 20 and 30 years or more, and are still performing efficiently.

**8.** Operated in our improved Double Hat and Washer Type Automatic-Lubricating Casing, the oil is kept in, under all conditions, as the casing-seals absolutely prevent oil leakage.

**9.** Costs less, because it saves power, reduces maintenance, and lasts longer. Thus, Silent Chain becomes a gilt-edge, long-pull investment with dividends (operating savings) assured, and absolute security of principal, in terms of maximum service life.

Link-Belt Silent Chain Drives are made for any horse power, and carried in stock in sizes up to 60 H.P. by distributors. Send for Data Book 125, and Pink List 725 of stock drives. Address nearest office.

4760

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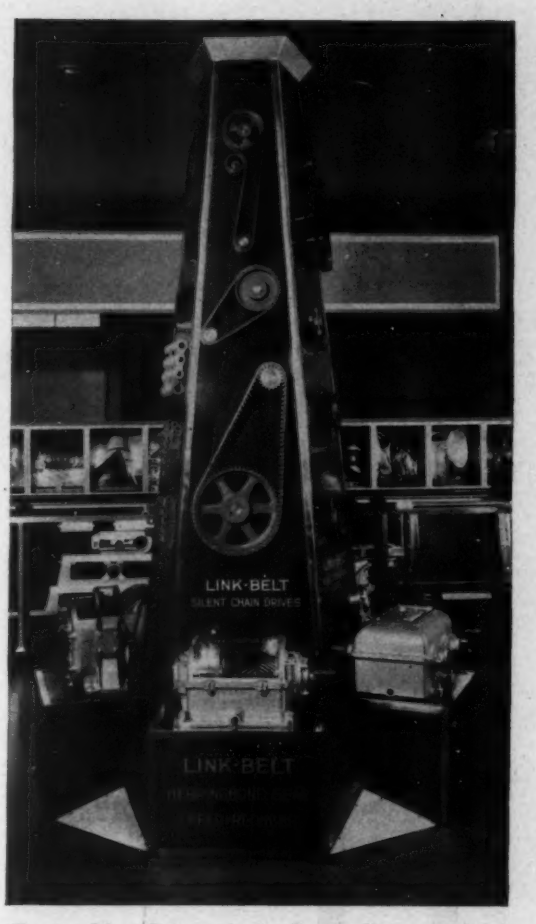


Showing Silent Chain and other Positive Drives on obelisk forming part of Link-Belt Exhibit at A Century of Progress Exposition, General Exhibits Building No. 1, Chicago

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# LINK-BELT SILENT CHAIN DRIVES

# Appleton
## Felts and Jackets

for

# UNIFORMITY

..QUALITY

..SERVICE

...FINISH

ADAPTABILITY

## APPLETON WOOLEN MILLS
Appleton, Wisconsin

# DU PONT
# QUINOLINE YELLOW P EXTRA CONC.

## *possesses good fastness to light*

DU PONT DYESTUFFS
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INCORPORATED

*Dyestuffs Division, Wilmington, Delaware*

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This du Pont fast-to-light yellow is worthy of investigation. Du Pont Quinoline Yellow P Extra Conc. is a pure bright shade and is used as a self color and in combination with other colors to produce many current bond shades. Write for samples and more particulars.

Our Technical Service Department is always available to help with your dyestuffs problems.

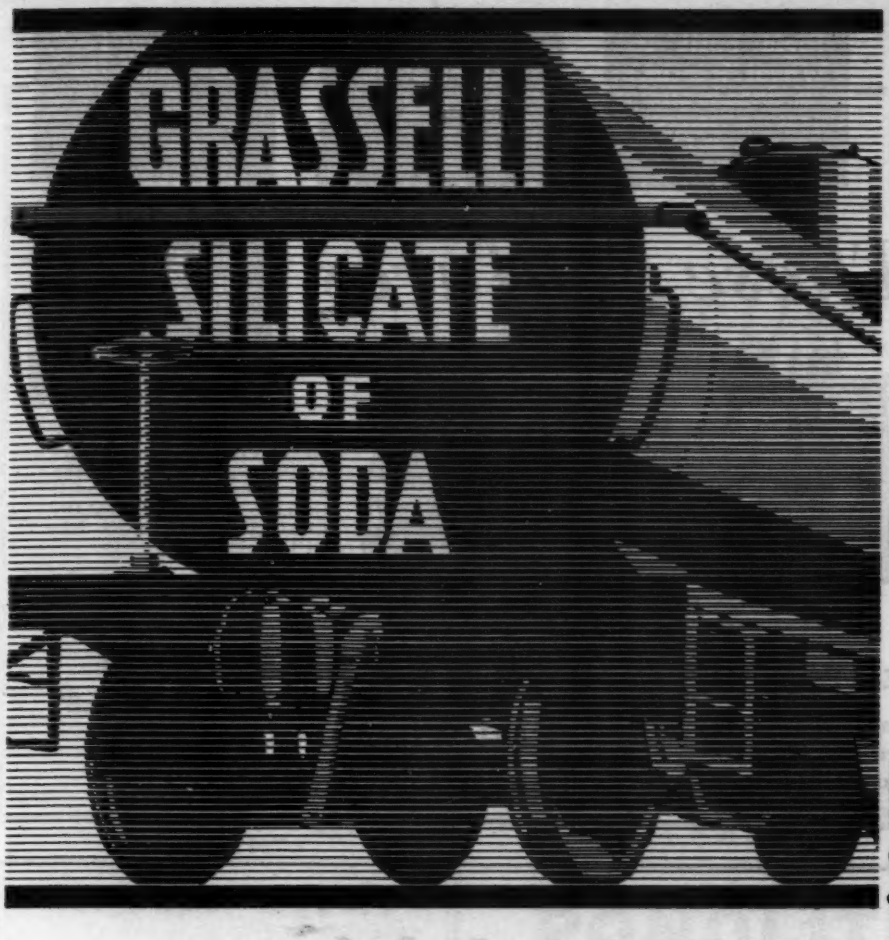
The superior finishing qualities of Perkins Calender Rolls are the natural result of the longest and broadest experience in the highly specialized art of making calender rolls.

Refills and remakes include the rolls of any manufacture, domestic or foreign, for any application in the paper industry.

**B. F. PERKINS & SON, INC., HOLYOKE, MASS.**

*Engineers and Manufacturers*

NO CALENDER CAN BE BETTER THAN THE ROLLS IN IT




*For*
# IMMEDIATE SHIPMENT

**A mineral loader used by many mills making various grades of paper. The use of Silicate of Soda increases retention of other fillers and sizes, improves formation and printing qualities of the paper and prevents "whiskers".**

***Other Grasselli Chemicals for Paper Manufacturers***

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| Acetate of Lead | C. P. Ammonium Hydroxide |
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| Aqua Ammonia | C. P. Sulphuric Acid |
| Barium Carbonate | Muriatic Acid |
| Barium Chloride | Salt Cake |
| Barium Sulphate (Blanc Fixe) | Soda Ash |
| Bleach | Sulphuric Acid |
| Caustic Soda | Tri-Sodium Phosphate |

**Write, wire or phone any of our branches. Our Research Department may be of help in solving some of your problems. This service is available to you.**

## THE GRASSELLI CHEMICAL COMPANY

**INCORPORATED** **CLEVELAND, OHIO**

***New York Office and Export Office: 350 Fifth Avenue***

**Albany Boston Charlotte Cincinnati Milwaukee Newark New Orleans Philadelphia**
**Birmingham Chicago Detroit New Haven Pittsburgh St. Louis St. Paul**

***Represented in Canada by CANADIAN INDUSTRIES, Ltd., Acids & Gen'l Chemicals Div., Montreal & Toronto***

## GRASSELLI GRADE
*A Standard Held High for 94 Years*

Automatic Crowning Device
- produces exact predetermined Roll Crown by single setting of a micrometer scale

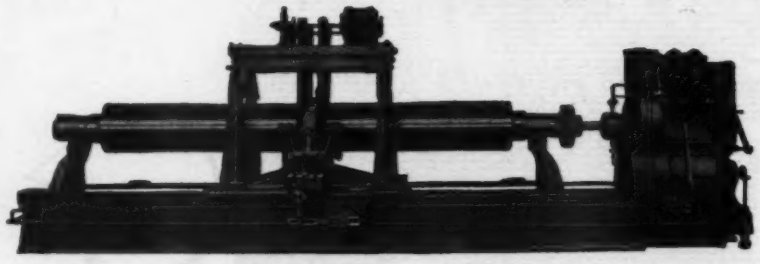
Rigid, built-in Wheel Mountings
- an exclusive Lobdell feature, assuring Accuracy and Speed of Grinding

Automatic Lubrication throughout
- assuring easy running and long life

Provision for Leveling the Bed
- to compensate for wear

Enclosed Geared Driving Head
- direct connected for safety and exclusion of dust and abrasive matter

# *Note These Features*



**Of course, there are many other exclusive advantages which help contribute to the high efficiency of Lobdell Grinders . . . CATALOG GLADLY SENT UPON REQUEST.**

***"Used by more than 70 different Paper Mills"***

**Other LOBDELL Products**

**Complete Calender Stacks,—"Puraloy" Chilled Iron Calender Rolls,—Improved Roll Caliper**

**LOBDELL**
**CAR WHEEL COMPANY**
***97 Years in Business***
**WILMINGTON·DELAWARE**

# TENAX
## and
# TISSUE

**Cylinder, Harper, Yankee, Fourdrinier and modifications for special purposes.**

**TENAX in all styles for better finish and long life.**

**ENDLESS in both one-sided and two-sided weaves.**

***Non-Users Are the Losers***

## LOCKPORT FELT COMPANY
NEWFANE, NEW YORK

# "Opacity OK"

KREBS PIGMENTS

## for Paper Makers

**TI-TONE P**—This is an ideal, all-purpose, medium-priced pigment for increasing opacity. It consists of approximately 85 per cent Ponolith HO and 15 per cent Krebs Pure Titanium Dioxide.

**PONOLITH HO**—This pigment contains approximately 30 per cent zinc sulphide. It is low in cost and is recommended for use in the manufacture of paper where a high pigmentation is permissible.

**KREBS PURE TITANIUM DIOXIDE**—This pigment has a high index of refraction and is the strongest known pigment to impart whiteness and opaqueness to paper.

**Paper manufacturers who use Krebs white pigments in the production of all grades of paper stocks know that the degree of opacity will be OK. An increasing number of production men are learning that opaqueness and whiteness of paper can be greatly increased with . . .**

# PONOLITH HO

**This is a zinc sulphide pigment containing approximately 30 per cent zinc sulphide. Ponolith HO is a low-cost pigment which gives highly satisfactory results in the making of stocks in which a high pigmentation is permissible. It can be added directly to the beater, thereby incorporating the pigment in the paper. It can be used advantageously for making first-grade coated stocks. This pigment which is chemically pure, white and uniform, not only greatly increases opacity, but also brightens and whitens paper.**

**Krebs technicians will be glad to demonstrate to paper manufacturers how Ponolith HO and other Krebs white pigments can increase paper opacity. Complete information, samples and technical cooperation will be given upon request.**

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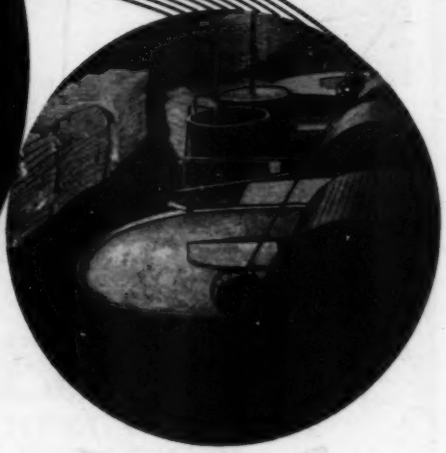

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THE PAPER INDUSTRY

A MONTHLY EDUCATIONAL JOURNAL

# What's Ahead for the Sulphite Industry

By P. A. PAULSON, Engineer

IT IS doubtful that any industry has suffered more during the recent depression than has the sulphite industry. Its difficulties did not start with the crash in 1929; we must go back ten or fifteen years to find the beginning. With the raw material rapidly dwindling away, with American capital invested in one mill after another in our neighboring country to the north, and, finally, when our European competitors depreciated their currency value to the extent that they were able to manufacture and deliver into this country sulphite pulp far below our manufacturing cost, it began to look as if the sulphite industry in the United States had sounded its death knell.

But "necessity is the mother in invention," and so in the present economic strategy it has become apparent that we cannot continue simply to follow the lines of least resistance and build mills in foreign countries, or buy sulphite pulp manufactured abroad. We have come to realize more and more the importance of national independence from foreign supplies of a product so essential to national prosperity.

**Possibilities in the South**

The abundance of wood in the South fit for making paper pulp has been well known for many years. It is only very recently, however, that an effort has been made with any degree of success to substitute the southern pine for the northern spruce in the sulphite process. The southern pine, it was thought, could be made into suitable pulp for papermaking only by the sulphate process, and, judging from the number of sulphate mills which in recent years have sprung up in the South, one could be tempted to believe that sulphate pulp had come to supplant sulphite pulp in the paper industry. But, while it may be possible to substitute sulphate for sulphite, it is by no means probable that it will be done. We are confronted with a problem, not only of finding a material suitable for papermaking pulp, but of converting the raw material into pulp at a price on par with, or below that of our foreign competition.

One of the requirements of most of the paper for which sulphite pulp is now used is that it must be white. The cost of producing sulphate pulp of sufficient whiteness to be used for newsprint, book and magazine papers would, therefore, make the process prohibitive.

The only method, therefore, it would seem, is to employ the sulphite process for converting the southern pine into papermaking pulp, and some very interesting work is already under way which has every indication of complete success. Particular reference is made to the efforts put forth by Dr. C. H. Herty, of Savannah, Georgia, and by the Forest Products Laboratory, at Madison, Wisconsin, under the direction of Dr. C. E. Curran. The results obtained to date at both Savannah and Madison show conclusively that a satisfactory quality of sulphite pulp for use in the manufacture of newsprint, book and magazine papers can be made from the southern slash pine.

That there are obstacles to be overcome can hardly be denied, for, as already pointed out, it is not merely a question of being able to produce a satisfactory quality pulp—it must be produced at a satisfactory cost also. Research work done on a semi-commercial scale has the advantage of having more ideal conditions than could be obtained on a mill scale; the cooking acid is usually made from liquid sulphur dioxide, whereby the strength and composition of the acid are easily controlled; the cooking conditions in a small digester in a research laboratory, no doubt, are more ideal than they are in the larger digesters in the mill. But from the viewpoint of a person who has had many years of experience in manufacturing sulphite pulp, these ob-

stacles are not at all insurmountable. We need only go to the beginning of the present century and compare the quality pulp made at that time from choice spruce wood, with that which is made today. It was a common occurrence at that time for pulp to be dumped into the sewer because it was too coarse to be used. In some mills the operators were being paid an extra bonus for not burning the pulp. The bleachability varied one hundred per cent from cook to cook. The screening rejections would run as high as eight to ten per cent. The paper machine had to be shut down several times a day to clean and *sour* the wire, because of pitch. But we have made remarkable progress during the past thirty years, so that today we are able to produce a pulp of absolutely uniform quality from day to day; no more pulp is over- or under-cooked, because we have learned how to determine the correct cooking endpoint; the bleach consumption is low because we know how to determine the bleachability before blowing the digester; the screening rejections have been reduced to below two per cent; the strength and yield are high according, as we have digester capacity and quality cooking acid to allow the cooking process to take place at the lowest possible temperature; pitch trouble is a thing of the past because we know how to properly operate acid plants to avoid making sulphates, and we know how to properly wash the pulp in the blow pits. We have also learned how to keep the paper machine wire continually *sour*, so that if other causes for pitch than those developed in the sulphite mill should occur, the effect will not be noticed on the paper machine. Surely we have not come to the end of our resourcefulness, and with the evidence of Dr. Herty and Dr. Curran before us we can safely predict that before long some of the finest sulphite mills will be found in the South.

**Forest Products Laboratory Research**

In his research work at Madison, Dr. Curran is not only seeking to find a suitable method for making a high quality sulphite pulp from the southern pine; he is also endeavoring to find a satisfactory method for eliminating stream pollution. Undoubtedly his plans are well made. If stream pollution from sulphite waste liquor is a nuisance in the North it surely will be more so in the South; and if we stop and think for a moment we will all agree that it is about time to put a stop to the enormous waste of allowing more than half of the solids in the pulpwood to go to the river when, if used as fuel, they would more than supply all the steam required in the sulphite mill. But Dr. Curran finds that the solving of one problem helps solve the other; that by using soda as a base in the cooking acid instead of lime, a much better penetration of the wood takes place, and the soda base liquors remove more of the resinous material during the pulping than do the lime base liquors. It is a well-known fact that pulp made with soda base liquor is whiter, is more opaque, and has a greater folding endurance than that made with lime base liquor.

It will be necessary, however, to reclaim the soda and use it over again, or the process will be too costly.

With the advent of chrome nickel steel, the evaporation of waste sulphite liquor has been greatly simplified, and with the soda base in the liquor the danger of scaling is entirely eliminated. The burning of the concentrated liquor has been done very successfully, and it has been shown that from 9,000 to 10,000 pounds of steam can be produced by burning the liquor from one ton of pulp. The heat value, therefore, will pay a nice return on the investment for the reclaiming equipment. There remains, however, to be adopted some method for burning the waste liquor that will avoid the formation of objectionable salts, such as sodium sulphide and Sodiumthio-sulphate, or some method for removing these salts, if formed, from the leached soda. It is this phase of the problem which is now being studied intensively at the Forest Products Laboratory, and we are assured that several promising leads have been developed which are expected to produce very gratifying results.

**Promising Outlook for Industry**

Summing up, then, it can be said with a considerable degree of certainty that the outlook for the sulphite industry in the United States is much better than it has been for the past ten or fifteen years and, despite keenest foreign competition, it is here to stay and prosper. It is needless to point out here the enormous wood supply available in southern United States. The figures have been published in the several trade journals from time to time. It will, however, be of interest to point out the many advantages to be gained by the method of logging which of necessity will have to be followed, for, due to the rapid decay of the wood, the logs should be brought directly from the forest to the mill—preferably as soon as cut. But with this method of logging, there will be no capital tied up in large storage piles, such as are found in the northern states. Consequently, there will be no insurance to pay on such storage piles, and there will be no unloading and reloading of the wood in the yard. The trees will have another year or so to stand in the forest and grow. The operation of the sulphite mill will be made simpler because the quality of the wood will always be the same, hence the quality of the pulp will be uniform.

It may be suggested here that the manufacturer of wood pulp in the north may also find it to his advantage to look into the matter of all year round logging. He will find, first of all, that the quality and uniformity of his product will be greatly improved. When checking up on the items mentioned above he will see a possibility of materially reducing the cost. While it is true that the wood does not deteriorate nearly as fast in the North as it does in the South, statistics show that there is a loss of five per cent the first year, and fifteen per cent the second year after the wood is cut. This, added to the growth of the tree if allowed to stand, the rate of which naturally increases with the diameter of the tree, will make no small item, and may be looked at not merely as loss of dollars and cents, but as a needless waste of our natural resources.

Probably when sulphite mills are erected in the South, and methods of operation are adopted to bring about better quality and lower cost, the sulphite manufacturer in the northern states will take notice and adjust his methods to bring about the greatest possible economy. One thing can be predicted with absolute certainty: capital will do well to stay at home, and the sulphite industry in the United States will prosper, as it never has prospered before.

# Whitewater Sedimentation Systems

**A presentation of theoretical and practical factors in design of equipment to recover desirable materials from whitewater**

By O. K. GRAEF
Consulting Mechanical Engineer

DURING the past few years, several whitewater sedimentation systems have been designed with a reasonable amount of success, and it is thought that in view of the scarcity of information relative to the design of such systems, a presentation of design methods might prove of interest.

It is known that several plants have spent large sums of money on this problem only to find that, for reasons more or less obscure, the results were far below those anticipated. The fact is that sedimentation basins can be designed today with small detention periods which will remove substantially all of the suspended matter in the water and by a cheap chemical treatment applied at the time of sedimentation, a large proportion of the dissolved solids can also be precipitated. The entire proportion of the dissolved solids can also be precipitated. The entire precipitate can be returned to the beaters without doing the sheet properties any harm or increasing process time. Further, the recovered water can be returned to the plant at a constant pH value, and the over-all cost of the treatment should not exceed 2 to 4 cents per thousand gallons treated, depending on the characteristics of the recovered water. Thus the system can be made nearly 100 per cent closed without building up slime, increasing the dissolved mineral content of the water, or to the detriment of the sheet.

Sedimentation basins may be made in any shape desired, provided only that the principles of good design are followed, and that those principles are carefully checked in practice. The design data are, of course, based entirely on theoretical principles, and a brief review of the underlying theory is presented, together with an experimental method for the evaluation of the theory.

### Characteristics of Whitewater

Paper-mill whitewater is likely to contain a certain proportion of short fibers and clay and size in suspension. The proportion of size and clay to fibers will vary with the sheet being made, and with the furnish. Much of the fiber may be readily screened out of the water, but, of course, practically all of the size and clay is lost. The size and clay at this point are in a very finely divided state, much of it being in a colloidal or semi-colloidal state.

Colloidal solutions vary from common chemical solutions in almost every way. By definition, a colloid is matter subdivided into aggregates of a minuteness approaching the molecular, so that they are capable of remaining dispersed in a dispersing medium indefinitely, without the necessity for the provision of any artificial means for retaining them in the medium. Colloids are not ionized; their boiling and freezing points do not differ from that of the dispersing medium; they do not exhibit the phenomena of osmosis; they are visible in the ultramicroscope and they are separable by means of filters while true solutions are not. Semi-colloids exhibit similar characteristics to a lesser degree.

The generally accepted explanation for the characteristic of a colloid to remain indefinitely in suspension is that the individual particles adsorb ions which produce electrical charges at the particle interfaces. The adsorption of ions is not specific for specific substances, but in the case of paper-mill wastes the charge is generally negative.

These solutions may be destroyed and precipitated by the destruction of the ionic charges on the particle interfaces by any of several methods. In general, the means utilized is by the addition of an electrolyte capable of supplying ions of the opposite sign. When the charges are neutralized, the particles combine to form flocs, and thus settle to the bottom. This floc formation is in accordance with the second law of thermodynamics, which relates to the degradation of energy. The neglect of the principle outlined above for the dissolution of colloids, is responsible for many cases of failure in the sedimentation of paper-mill whitewaters.

Paper-mill whitewater, contains in addition to its other ingredients, varying amounts of alum. In many cases, this alum content is relied upon to produce coagulation and settling. That it is not always effective, follows from the fact that papermakers alum, as a rule, contains an excess of alumina of from 0.5 per cent to 1.0 per cent above the theoretical quantity required, and is, therefore, basic. But for sedimentation of most whitewaters, an acid electrolyte is required because the whitewater particles carry adsorbed negative ions and, hence, require positive ions for their effective precipitation. Therefore, if an acid alum were to be used instead of a basic alum in the beaters, improved sedimentation could be effected. This is borne out in practice, and in several plants effective sedimentation is had at pH ranges of 4.0 to 6.0 using acid alum as the electrolyte.

The disadvantage in the use of acid alums are that corrosion of equipment is increased, and re-use of the recovered water in the beaters tends to build up the content of sulphates in the system. This exerts marked detrimental effects on the sheet properties and tends to prolong the beating time of the stock.

The formation of flocs by the addition of an electrolyte, as alum, is a reversible process, and care must be used not to overdose. Small variations of electrolyte ratio, either over or under the required amount, will throw the reaction to either one side or the other of the iso-electric point and cause a reversion of the flocs already formed to the colloidal or semi-colloidal state.

This causes cloudy overflows with a consequent reduction of sedimentation basin efficiency.

An average whitewater from a book mill, will contain about 85 per cent clay and 15 per cent fibers, expressed in proportions of solids in suspension. The specific gravity of clay is in the neighborhood of 2.6. Due to the finely divided state of a thin slurry of clay in water, however, many of the finer particles are colloidal or very nearly so, and may require a great deal of time to completely precipitate. In some cases, less than 50 per cent will be precipitated in two hours time, but an average of about 65 per cent precipitation in two hours is usual in most cases.

The fibers contained in whitewaters vary greatly with the furnish; the higher the proportion of short, fibered stock in the furnish, the larger the proportion of short fibers in the whitewater, and vice-versa. For an average book-mill whitewater, about 15 per cent of the total suspended matter will be found to be fibers. The specific gravity of the bone-dry fiber is about 1.5; but the fiber is hollow, and the volume of the void is about ⅓ the volume of the fiber, therefore, when in water at low consistences, the specific gravity of the mixture is practically unchanged. In sedimentation, however, the specific gravity of the fiber, regardless of its water content, is still 1.5, and is sufficient, therefore, to cause sedimentation provided the void is entirely filled with water. The rate of subsidence of a fiber in water is low, but this is probably due to the shape of the fiber. If any amount of air or gas is held in the fiber void, it will float. This difficulty is rarely encountered in the sedimentation of well beaten stock.

The effect of temperature on the sedimentation of whitewater, is to increase the rate of subsidence of the particles, and hence to improve sedimentation. This is probably brought about by the reduction of the viscosity of the water with increased temperature, and the more rapid reaction of the flocculating electrolytes in waters of higher temperature.

**Phases of Whitewater Sedimentation**

Sedimentation of whitewaters takes place in three phases where the suspensions are as dilute as these usually are. There is no distinct line of demarcation between the phases, as each gradually passes into the next succeeding phase. In the first, the particle or floc enters the sedimentation basin near the surface and begins to fall through the water without hindrance from other particles or flocs, being pulled down by gravity with only the resistance due to the water acting against it. As it nears the bottom of the basin, other particles or flocs begin to interfere with its fall, and it enters the second phase. As the concentration of particles in this area gradually increases, it enters the third stage where the sludge is slowly increasing in density or compacting. The first stage is called *free settling;* the second, *hindered settling;* and the third, *concentration.*

Free settling begins at the instant a particle is introduced into the basin, and ceases at the instant it reaches a point in its fall where the concentration of other particles becomes great enough to interfere with its fall. During this time, the velocity of fall is expressed by the well known *Stokes Law.*

$$(1) \qquad v = K D^2 \left(\frac{p' - p}{Z}\right)$$

Where $v$ is the velocity of fall in feet per second; $D$ is the diameter of the particle in inches; $p'$ is the density of the solids in pounds per cubic foot; $p$ is the density of the liquid in pounds per cubic foot; $Z$ is the viscosity of the liquid in centipoises; and $K$ is a constant.

The phase of hindered settling which the particle next enters cannot be mathematically explained by Stokes Law, for the reason that both the viscosity and density of the solution are increased as this phase of settling progresses, and the particles become more intimately associated. It has been experimentally shown, however, that under the conditions of this phase, the following expression applies:

$$(2) \qquad v = K \sqrt{D \left(\frac{p' p''}{p''}\right)}$$

Where $v$ is the velocity of fall in feet per second; $D$ is the diameter of the particle in inches; $p''$ is the apparent density of the solid-liquid mixture in pounds per cubic foot; $p'$ is the density of the solid in pounds per cubic foot; and $K$ is a constant.

From an examination of *(1)* and *(2)* above, it will be apparent that the velocity of fall varies from the square of the diameter of the particles in free settling to the ½ power of the diameter in hindered settling, and will probably vary as an intermediate power or powers during the transition stage.

When the sedimentation has reached a certain point, the density of the solid-liquid mixture becomes so great that, in effect, a concentration of the settled particles is taking place, rather than a settling, and in this phase the rate of settling decreases as the concentration progresses. It can be shown, therefore, that if *(1)* is written differentially it will express the rate of concentration.

$$(3) \qquad \frac{dX}{dt} = K D^2 \left(\frac{p' p''}{Z'}\right)$$

Where $X$ is the height of the sludge in inches; $t$ is the time in seconds; $K$ is a constant; $D$ is the average size of the particles in inches; $p'$ is the density of the particle in pounds per cubic foot; $p''$ is the density of the solid-liquid mixture in pounds per cubic foot; and $Z'$ is the viscosity of the solid-liquid mixture in centipoises. This equation can be integrated graphically if $p''$ and $Z'$ can be expressed as functions of $X$. This may be done by the method outlined by Robinson. *(Ind. & Eng. Chem.* 18, 869, 1926.)

Inspection of *(1)*, *(2)* and *(3)* above, indicate several points where factual information and theoretical requirements are difficult to correlate: viz., the relative settling velocities of particles of equal size, weight and shape are equal, but we do not have the condition. Our particles are irregular in shape and size and are of varying densities. Therefore, constants must be included in the equations and experimentally determined in order to numerically evaluate the formulae. The particles, as stated above, have varying velocities of fall, ranging from the square of the diameter to the ½ power of the diameter, in the transition stage. This transition stage is difficult to define. The resistance to fall, and compaction of the sludge increases with the density of the medium and with its viscosity, and this increase is greater, relatively, the smaller the particle. The suspending fluid acting with increased concentration precisely as though its density were increased.

This acts to decrease the settling rate for the reason that for a given particle, the decrease is proportionately greater the less the specific gravity, because $v$ is proportional to $(p'-p)/p$. Thus it follows that these formulae are difficultly evaluable for problems involving the sedimentation of so complex a fluid as whitewater.

It is considered, however, that the three formulae as given, express some very important information, which the designer of a sedimentation basin will do well to bear in mind during the progress of the design. Equation *(1)* indicates the depth to which the smallest particle will fall during the first phase of settling, and thus is of importance in the determination of the head allowable on the effluent weir. This, of course, will have a bearing on the determination of the length-width ratio of a rectangular basin. In combination, *(1)*, *(2)* and *(3)* will determine the depth of tank necessary to produce the desired results. And *(3)* is of great importance in the determination of the sludge storage volume required to be provided at the bottom of the basin in order that the sludge consistence may be as great as desired.

As before stated, the disadvantage in the use of these formulae, lies in the fact that such a large amount of experimental work is required in order to fully evaluate them. It is not believed that they should be slighted, however, and the data obtained from this source should be carefully checked against the data which is obtained from the experimental method to be described.

Inspection of this experimental method will disclose the fact that in each case, every factor having a bearing on sedimentation is considered in the experiment without the disadvantage of being obliged to evaluate anything except the resultant data.

**Test Data Required**

Two series of experiments are necessary, the first to determine the area of sedimentation surface, i.e., the surface area of the sedimentation basin, and the second series to determine the volume of the sludge storage space required in order to provide the desired sludge consistence at the sludge outlet.

It should be here stated that the samples of whitewater collected for these tests must be representative in every respect. They must not be allowed to stand longer prior to the test, than the whitewater will stand in practise. The temperature of the samples must be maintained closely within the probable limits to be expected under normal operating conditions. The chemical dosage, if any, must be accurately proportioned, and mixing of the chemicals must be representative of the mixing expected to be done in the plant. All of the tests should be made in a 2000 cc. graduated cylinder, and all of the equipment used in the tests should be clean.

Because varying furnishes are used for different grades of paper, it follows that each whitewater will vary, and these variations are, in some cases, quite large. It is therefore necessary for a sedimentation test to be run on each type of whitewater produced. After meeting all of the above requirements as to handling and mixing the samples, the water is settled in the 2000 cc. cylinder. The rate of subsidence of the top surface of the settling solids is carefully timed, and the result is reduced to feet of subsidence per hour. The consistence of the sample is then carefully determined, and is considered to be the inlet consistence of the water coming to the basin. This consistence is expressed as parts of water per part of solids. Then the area of the basin required to settle 1 ton of dry solids introduced per 24 hours, is determined from the relation:

$$(4) \qquad A = \frac{1.336\,(c-p)}{R}$$

Where $A$ is the area in square feet of basin required per ton of dry solids admitted into the basin per 24 hours; $c$ is the influent consistence expressed as parts of water per part solids; $p$ is the sludge discharge consistence expressed as parts water per part solids; and $R$ is the rate of subsidence of the surface of the settling solids in feet per hour. From the tests established on each water, the basin must be designed to provide an area equal to the greatest area required as shown by *(4)*, in order that the effluent may be clear. If a value less than the greatest were chosen, then when any whitewater requiring a greater area is introduced into the basin, the sludge will build up, and finally particles will begin to overflow with the effluent. The only remedy then would be to remove the sludge at a lower consistence, or to reduce the quantity of influent to the basin.

The second series of tests may now be run, and these need be run only on the water which requires the greatest settling area. This series of tests may also be run in the 2000 cc. cylinder, and the concentration of the sludge, expressed as parts of water per part solids determined for successive increments of time. Because the head of clear water overlying the surface of the sludge is not a factor in sludge concentration; i.e., the subsidence of the surface of the sludge is uniform regardless of the tank depth, the supernatant liquor overlying is siphoned off at frequent intervals.

It will be noted that the sedimentation and concentration takes place at a decreasing rate, and the economical time should be carefully determined; i.e., if it is noted that the concentration during the period 1¾ hours to 2 hours is from 25 to 21 parts liquid per part solids, and during the period of 2 hours to 2¼ hours is only from 21 to 19 parts liquid per part solids; then, obviously, it is impractical to concentrate to less than 21 parts liquid per part solids. The economical time to allow for sedimentation is, therefore, 2 hours.

This being the case, each square foot of tank bottom area will have suspended over it or resting on it:

$$(5) \qquad w = \frac{83.3\,t}{A}$$

Where $w$ is the pounds of dry solids, which is $t$ hours supply to 1 square foot of basin bottom area; $t$ is the time of sedimentation in hours; and $A$ is the area required to settle 1 ton of dry solids per 24 hours.

The part of the solids which has been in the basin for from $t'$ to $t$ hours will be concentrated to an average consistence, as expressed by:

$$(6) \qquad p = \frac{(p' + p'')}{2}$$

Where $p$ is the average consistence in parts water per part solids of the sludge, $p'$ is the consistence in parts water per part solids of the sludge at time $t$, and $p''$ is

the consistence in parts water per part solids of the sludge at time $t'$.

The weight of the solids in this volume of sludge at $p$ consistence will then be:

$$(7) \qquad w' = w\left(\frac{t - t'}{t}\right)$$

Where $w'$ is the weight of dry solids in $(t - t')$ hours supply to 1 square foot of bottom area, $t'$ is first increment of time, and $t$ is the final time.

Then in each cubic foot of sludge which has an average consistence of $p$, the weight of the solids will be:

$$(8) \qquad W = \frac{62.35\,S}{(1 + p\,S)}$$

Where $W$ is the pounds of solids per cubic foot of sludge; $S$ is the specific gravity of the solids; and $p$ is the average consistence of the sludge in parts of water per part solids.

The height of a volume of liquid containing $W$ pounds of solids, will then be:

$$(9) \qquad X = \frac{w'}{W}$$

Where $X$ is the depth of the volume of liquid in the increment of time considered; $w'$ is the weight of the dry solids in $(t - t')$ hours supply to 1 square foot of bottom area; and $W$ is the pounds of solids per cubic foot of sludge.

The total depth of basin required for the worst condition, to give the sludge discharge density required, will then be the summation of all the increment depths, $X$, determined as above. To this should be added 1 to 3 feet space for supernatant liquor, and about 1 foot allowance for a factor of safety. The 1 to 3 feet allowance for supernatant liquor is allowed on the basis of head on the overflow weir. For circular tanks, 1 foot is ample, while for long, narrow, rectangular tanks, where a large head is present on the effluent weir, at least 3 feet should be provided.

### Utilization of Test Data

An example of the above procedure follows:

TEST RESULTS—TEST NO. 1

| Whitewater from furnish for | WW inlet consistence. Parts water per part solids, = $c$ | Rate of subsidence of surface of settling solids, = $R$ | Area required per ton solids (dry) per 24 hours, in Sq. Ft., = $A$ |
|---|---|---|---|
| Book Paper No. 1..... | 240 | 39 | 7.86 |
| Book Paper No. 2..... | 250 | 38 | 8.10 |
| Book Paper No. 3..... | 260 | 40 | 8.09 |
| Catalog Paper No. 6..... | 210 | 36 | 7.06 |

From this tabulation of the results of the test, it appears that the worst condition occurs when book paper No. 2 is being run, and the second tests are run only upon this water.

TEST RESULTS—TEST NO. 2

| Time of settling, minutes | Parts of water per part of solids in the settled mass |
|---|---|
| 0 | 250 |
| 15 | 73 |
| 30 | 61 |
| 45 | 49 |
| 60 | 39 |
| 75 | 31 |
| 90 | 25 |
| 105 | 21 |
| 120 | 19 |

Thus, Test No. 2 indicates that if a sludge discharge density of 20 parts is desired, 120 minutes must be allowed for settling. This being the case, the basin volume will be; by *(5)*,

$$\frac{83.3 \times 2\ hrs.}{8.10\ Sq.\ Ft.} = 20.3 \text{ lb. of solids per square foot.}$$

The part of the solids that has been in the basin for 105 to 120 minutes will be at an average consistence of $(21 + 19)/2 = 20$ parts, by *(6)*, and the weight of the solids at this consistence in the volume will be; by *(7)*,

$$20.3 \times \left(\frac{2\ hrs. - 1.75\ hrs.}{2\ hrs.}\right) = 2.5 \text{ lb. and this is 15 minutes' supply to 1 square foot of basin bottom area.}$$

The specific gravity of clay may be taken at 2.6, and that of fiber at 1.5, then if analysis of the solids indicate 85 per cent clay and 15 per cent fibers,

$(0.85 \times 2.60) + (0.15 \times 1.5) = 2.4$, and this may be assumed as the specific gravity of the sludge. Then in each cubic foot of sludge whose consistence is 20, the weight of the solids will be; by *(8)*,

$$\frac{62.35 \times 2.4}{1 + (20 \times 2.4)} = 3.05 \text{ pounds.}$$

And the height of a volume of fluid of 1 square foot cross section, containing 3.05 pounds of sludge will be; by *(9)*,

$$\frac{2.5\ pounds}{3.05\ pounds} = 0.82 \text{ feet.}$$

The same procedure is carried out for each increment of time considered, and the results may be tabulated as follows:

| $t$ Hours | $p'$ | $p$ | $W$ | Increment depths, $X$ in feet |
|---|---|---|---|---|
| 0 | 250 | | | |
| | | .....162 | 0.38 | 6.58 |
| ¼ | 73 | | | |
| ¼ | 73 | | | |
| | | ..... 67 | 0.93 | 2.68 |
| ½ | 61 | | | |
| ½ | 61 | | | |
| | | ..... 55 | 1.15 | 2.17 |
| ¾ | 49 | | | |
| ¾ | 49 | | | |
| | | ..... 44 | 1.40 | 1.79 |
| 1 | 39 | | | |
| 1 | 39 | | | |
| | | ..... 35 | 1.76 | 1.42 |
| 1¼ | 31 | | | |
| 1¼ | 31 | | | |
| | | ..... 28 | 2.19 | 1.14 |
| 1½ | 25 | | | |
| 1½ | 25 | | | |
| | | ..... 23 | 2.66 | 0.94 |
| 1¾ | 21 | | | |
| 1¾ | 21 | | | |
| | | ..... 20 | 3.05 | 0.82 |
| 2 | 19 | | | |

The summation of these depths, $X$, gives 17.54 feet. This indicates that the basin depth must not be less than 17.54 feet if sludge is to be removed from the bottom at a consistence of 20. As before stated, an addition must be made to this for supernatant liquor and for a factor of safety, but this varies for the

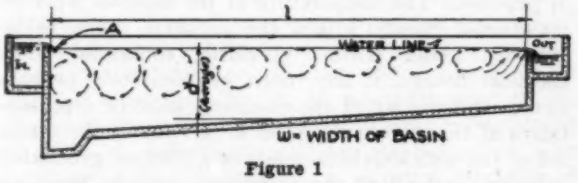


Figure 1

condition. As this is an unusual depth, a discharge consistence of 20 is probably greater than can be economically obtained, and the requirement for a consistence will have to be revised.

In the ordinary sedimentation basin, the influent is introduced over a weir, or through slots at one end of the basin, and the effluent is removed by means of a skimming weir at the other end. There is thus a distinct current flowing through the basin from inlet to

outlet. However, because of unavoidable inaccuracies, due to construction, temperature variations, etc., there are numerous eddy currents in the stream, similar to those shown in Figure 1.

When particles fall to the bottom of a basin, they displace proportionate amounts of water which must rise to fill the space just vacated, and if we assume that every particle is introduced into the basin at $A$ in Figure 1, then it is obvious that all particles which settle out of the solution must settle against a rising current which has an average velocity

$$(10) \qquad v' = \frac{Q}{lb}$$

Where $v'$ is the velocity of the rising current; $Q$ is the quantity of fluid displaced; and $l$ and $b$ are the length and breadth of the basin.

This rising current may be of varying velocity at points, and may even be of negative velocity; i.e., falling, in places. Now if $v$ is the velocity of settlement of a particle, $v'$ must be less than $v$ if the particle is to reach the bottom.

Mr. Graef's article will be continued in a succeeding issue.

# Paper Making Studies in Both France and Italy

By LOUIS E. WISE, Professor Emeritus
New York State College of Forestry

AN INSIGHT into the true significance of recent French contributions to the paper industry would require an actual visit to France. French schools, laboratories, and plants would have to be explored, for quite often the researches of that subtle and versatile nation never see the light of day. Sometimes they receive scant or passing reference in obscure publications. Sometimes they are overlooked entirely.

In 1926, when the author was working with Prof. Gabriel Bertrand at the Pasteur Institute, he happened to mention the Cross and Bevan method for determining cellulose in wood or wood pulp. M. Bertrand was annoyed, to say the least. "The Cross and Bevan method?" he asked caustically. "What a misnomer! Cross and Bevan never discovered the principle on which that method was based. Frémy, my old teacher, and his colleague Terreil first used chlorine in the separation of cellulose years and years before Cross and Bevan referred to it, in their monograph. And then Cross and Bevan failed to give the credit where it belonged!" Later, in a musty old volume of the *Comptes rendus* (the scientific journal of the French Academy), the author found Dr. Bertrand's statement substantiated.

To do them justice, Cross and Bevan had undoubtedly never seen the meagre reference to the action of chlorine water on lignin, and had worked out their method quite independently.

But here you have a characteristic case! The French should be judged by what they *do*, rather than by what they publish.

### Raw Material Studies

Take the case of the raw materials used in paper manufacture. Prof. Vidal of the French School of Papermaking at Grenoble[1] has given briefly the careful tests made at that institution on the papermaking qualities of certain French colonial woods. This illustrates a valuable piece of research yielding *negative* results, for it gives economic and technological data showing that *(up to the present)* these woods are not suited to the needs of the paper industry. On the other hand, Vidal, Brot, and Aribert[2] have shown that a pine *(Pinus uncinata)* could be utilized in making kraft and bleached paper pulps.

The use of eucalyptus in papermaking (a genus frequently exploited in this connection, in the U. S. A., Australia, and elsewhere) has again been pointed out by Charles Groud.[3]

Colas[4] takes up the advantages of paper pulp made from North African esparto. The yields are about 45 per cent. The fiber has good felting qualities, and is smooth, and its use is increasing, especially in France. The use of chlorine in pulping flax wastes, which are then given an alkaline treatment, is pointed out by Isinard.[5]

The pulp is strong, readily hydrated, and finds applications in the manufacture of cigarette, bible, photographic, and legal paper, bank notes and onion skin.

Bouvier[6] has reviewed the status of the paper industry in the French colonies giving the products of mills now in operation. Like Professor Vidal, he points out the properties of possible papermaking fibers grown in the colonies, giving the reasons why they are not in current use.

Michel-Jaffard[7] gives the substance of five lectures delivered at the University at Lille, on the scientific principles underlying the preparation of cellulose and of textile fibers. This contribution is noteworthy because of the wide industrial experience and scientific background of M. Michel-Jaffard (whom the writer remembers as a pioneer in connection with commercial pulping of straw by means of chlorine in France). The French author, lecturing at the Institute of Applied Chemistry, covered modern cooking methods for soda, kraft, and sulphite pulp, and discussed the chemistry of cellulosic raw materials.

A monograph for calculating approximately the weight of baled, air-dried pulp from the gross weight of the pulp has been devised by Ribiere-Raverlat.[8]

Bergman[9] has made a comparative study correlating the digestions (cooks) with the bleachability of the resultant pulps, using the methods of Tingle, Enso,

Bjorkman, and his own. Forty-eight samples of chemical pulp were examined. The lignin-chlorine relationship is one of the subjects discussed.

In the testing of pulps, de Fayard[10] has described a modification of the Cross and Bevan (Frémy!) procedure, for determining *total, alpha, beta* and *gamma* celluloses. (It is amazing how this old nomenclature still persists; as though the beta and gamma fractions actually represented sharply defined, clean-cut portions of the cellulose.) De Fayard's method gives results comparable with those of the usual procedure, and because of its simplicity it deserves a brief description. One gram of dry material is treated with 50 cc. of a hypochlorite solution. (A liter of this solution is made by filtering an aqueous mixture of 50 grams of bleaching powder and 50 grams of $Na_2CO_3$ and by diluting the filtrate to volume.) The pulp suspension is stirred for 10 minutes, then heated for 10 minutes at 35 deg. C.; subsequently treated with 0.5 cc. glacial acetic acid, and allowed to stand until the pulp appears perfectly white. This ordinarily takes two to three hours. Thereupon, the cellulose is filtered on a Gooch crucible, washed with 1 liter of water, placed in a breaker for 15 minutes at 10 deg. with a $Na_2SO_3$ solution, and washed by suction with 50 cc. of a similar solution. This treatment is followed successively by washing with hot water, 20 cc. of 0.05 per cent $KMnO_4$, water, aqueous $SO_2$ solution, water, alcohol and finally ether. The dried product is total cellulose. The methods for determining the three Greek cellulose fractions need not be described. They are very similar to those given in the literature.

With a view toward obtaining uniform pulps, "G. M."[11] has suggested methods for controlling beater action. Besides the usual laboratory tests, it is advisable to know the exact physical condition of the beater, and to take into account consistency, freeness, temperature of the stock, revolutions of the roll, arrangement of bars, etc.

The loading of paper has been studied by Vander Stichel.[12] Kaolin and talc are considered the best fillers and co-efficients have been given whereby the probable retention of these fillers may be calculated. The importance of talc in papermaking has also been discussed by "V. T. R."[13]

According to this investigator, better sizing, more uniform calendering, a better printing surface and increased flexibility are among the advantages attending its use.

Sizing has received only slight attention in the recent French literature. "G. M."[14] reports a long study on the effect of temperature and pH on sizing. Fournier[15] had previously discussed rosin-sizing in some detail. The disappearance of sizing after the elapse of a certain time period (i. e., the resulting decrease of the resistance of paper to ink penetration) has been pointed out by "D. C. M. I. P."[16] While this change in properties remains somewhat obscure, the author discusses the possible factors, among which humidity appears to play a role.

### Paper-Testing Research

The French have probably focused their greatest attention on the testing of paper. The use of ultra-violet light in the studying of pulp and paper has been emphasized by Gruenman.[17] He points to its use in the control of bleaching, in the identification of fibers as an auxiliary to the physical and chemical tests, in testing the durability of paper, the light-fastness of the coloring matter used, and also in finding hidden defects in paper.

That Cellophane sheets are permeable to ultra-violet light was shown by Clement, Rivière and Beck.[18] According to these investigators, ultra-violet light does not work destructively on cellulose.

The effect of variations in thickness of the sheet (obtained by friction, or by pressing alone) on the bursting strength of paper was studied by Ribière-Raverlat.[19] In sheets weighing under 70 grams per square meter, the greatest (Asheroft) bursting strength was manifested when frictioning was used. With sheets of greater weight however, pressure gives a paper with higher bursting strength.

The same author[20] made parallel experiments using the Naumann-Schopper flexometer and the Mullen tester. The advantages seem to be with the latter, although there appears to be a definite relationship between the data obtained from the two sets of experiments.

This flexometer also served in distinguishing between the two faces of a specific board sample, and of indicating internal defects. This also was reported by Ribière-Raverlat.[21]

In place of the Schopper folding endurance tester, Lhomme and Argy have devised another instrument for this purpose. This is well described by Fournier,[22] who also critically discussed the factors governing precise results in determining the resistance of papers to the fold test.

The same author[23] has studied the variance in tensile strength tests with different widths of band. For example, often the strength of a band 3 cm. in width is more than twice that of one having a width of 1.5 cm. This investigator has devised a tensile strength method correlated more closely with conditions that obtain in the actual use of paper.

Ribière-Ravelat[24] by the use of the photoelectric cell has expressed color, graphically. He has devised a method for determining the amount of coloring matter to be added to fibers to produce a definite color shade.

The photoelectric cell also served in the measurement of opacity of paper as reported by Roy-Rochon.[25]

Lhomme and Bard[26] made a critical study of porosity showing the effects of different variables.

About five years ago, Micoud[27] began his systematic, comprehensive series of articles on the physical testing of paper. He is one of the regular contributors to *Papier*, and only some of his more recent contributions will be referred to here, and then only with the greatest brevity. In 1931, this author[28] critically discussed tests evaluating rigidity, hardness, rattle, transparency, opacity, gloss and color. He also took up laid paper and watermarking, as well as the physical properties of printing, typewriting, writing, drawing, blotting and filter papers.

The following year, Micoud[29] took up successively the physical properties of cigarette, muslin, carbon, tissue, waxed, sanitary and rope-papers. He then gave specifications for hangings, cable and insulating papers, and papers used in wrapping metals. Envelopes and

document covers were also reviewed, as were the properties of tracing, wrapping, manila, kraft and grease proof papers. Vegetable and imitation parchment, tar paper and photographic papers come up for discussion as well. All in all, M. Micoud has made a pretty thorough job on the physical properties of the finished sheet.

However, Micoud has not been alone in discussing papers used for specific purposes. Papyro[30] took up the important factors used in the production of chromolithographic paper, emphasizing the proper choice of raw material, refining, beating, loading, sizing, and the treatment on the paper machine.

Postl[31] outlines the specifications that should be met and the factory conditions that obtain in fabricating paper for wrapping photographic plates. According to the author, half sulphate and half soda pulp are usually used in making this paper. "D. C. M. I. P."[32] reviews the manufacture and composition of filter paper, and "L. C."[33] deals with the manufacture of Cellophane.

Finally, Groud[34] points out the reliance which certain phases of agriculture places on the products of the paper industry. Among the topics discussed is the covering of ground near plantings *with paper*, to retain heat and moisture and to keep the weeds in check.*

### Activity Among Italians

Italian pulp and paper chemists and technologists seem to have published relatively little during the past few years. Voicing his enthusiasm in publications in American scientific journals, Dr. Pomilio[35] has reiterated the importance of using chlorine in industrial pulp manufacture. Dr. Pomilio's energy and creative genius are a part of the élan of present day Italy. The applicability of delignification by means of chlorine to cereal straws is again emphasized.

In countries which lack forests, but which raise abundant cereal crops and have cheap hydroelectric power, the Pomilio process becomes especially econonomical. Plants for the manufacture of chlorine-pulp have been opened recently in the Argentine and in Chile, and these are described by the Italian inventor. Thus old Professor Frémy's obscure method has developed into a technological process.

Paterno[36] has investigated the action of $Na_2CO_3$ on pulp samples of different types, including, among others, hemp, esparto and straw cellulose. Discs, about 10 cm. in diameter were dried at 100 deg. C., weighed, and then placed for 3 hours in a 10.36 per cent solution of sodium carbonate, maintained at 10-12 deg. C. After the removal of the surface liquid by a standardized procedure with filter paper, the moist pulp was weighed, then dried and re-weighed. On other samples, absorbed distilled water was also similarly determined. Apparently the volume of liquid taken up by a *specific sample of pulp* in water is the same as that imbibed from a $Na_2CO_3$ solution, and thus serves to characterize that individual pulp. Absorption tests on these pulp samples with 5 per cent $NaH_2PO_4$, and with 25 per cent, 50 per cent and glacial acetic acid were also made. Repeated treatment of a pulp with 15 per cent $Na_2CO_3$ serves to remove the greater portion of the hemicelluloses, and this pretreatment may be of value if the pulps are to be used in viscose manufacture.

Paterno has also advanced the interesting hypothesis that a part of the so-called hemicellulose fraction of pulp may be formed during the pulping of the wood in the digester. A pulp sample was extracted repeatedly with 18 per cent $Na_2CO_3$ until the hemicelluloses were practically removed. On exposure to air, however, in the presence of water and salts or alkalies, more hemicellulose seemed to be generated. (The uncertainty attending the usage of the term *hemicellulose* is thus very aptly illustrated.)

The use of long fibers from the linden tree in papermaking was studied by Camillo Levi.[37]

These yellow fibers which were far from uniform, either physically or chemically, yielded approximately 77 per cent of crude cellulose and seemed suited to the manufacture of wrapping paper.

The only other Italian reference that need be given is a comprehensive series of articles on the complete analyses of cigarette papers, written anonymously in the *Bolletino Stazione Sperminentale Industria carta*, and translated into French[38]. This completes a brief resumé of the recent literature through the early part of 1933.

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1 *Chimie et Industrie*, Special No. (Mar. 1932) 694-701.
2 *Papier*, 34, No. 12, 1301 (Dec. 1931).
3 *Papeterie*, 55, No. 4, 186 (Feb. 25, 1933).
4 *Ibid.*, 53, No. 6, 362 (1931).
5 *Papier*, 35, No. 9, 953 (Sept. 15, 1932).
6 *Bull. inst. pin.* (1932) 121.
7 *Papier*, 35, No. 9, 935-8 (et seq.) (1932).
8 *Papeterie*, 54, No. 18, 994 (Sept. 25, 1932).
9 *Papier*, 35, No. 10, 1059 (Oct. 15, 1932); No. 12, 1275 (Dec. 15, 1932).
10 *Bull. inst. pin.* (1932) 189.
11 *Papeterie* 54, No. 10, 530 (May 25, 1932).
12 *Ibid.*, 54, No. 13, 702 (July 10, 1932).
13 *Ibid.*, 54, No. 21, 1165 (Nov. 10, 1932).
14 *Ibid.*, 54, No. 20, 1106 (Oct. 25, 1932) et seq.
15 *Ibid.*, 53, No. 10, 618 (May 25, 1931).
16 *Ibid.*, 53, No. 15, 934 (Aug. 10, 1931).
17 *Papier*, 35, No. 5, 531 (May 15, 1932).
18 *Chimie et Industrie*, Special No., 702 (Mar. 1932).
19 *Papeterie*, 54, No. 11, 582 (June 10, 1932).
20 *Papier*, 35, No. 10, 1055 (Oct. 15, 1932).
21 *Ibid.*, 35, 177 (1932).
22 *Papeterie*, 53, 146 (1931).
23 *Ibid.*, 53, No. 17, 1066 (Sept. 10, 1931); *Pulp and Paper Mag. Can.*, 31, No. 44, 1193 (Oct. 29, 1931).
24 *Papeterie*, 54, No. 8, 410 (April 25, 1932) et seq.
25 *Papier*, 34, No. 7, 749 (July 15, 1931).
26 *Papeterie*, 53, No. 23, 1438 (Dec. 10, 1931).
27 *Papier*, 31, 1147 (1928).
28 *Ibid.*, 34, No. 3, 251; No. 5, 475; No. 6, 587; No. 7, 699; No. 8, 811; No. 10, 1035; No. 12, 1259 (1931).
29 *Ibid.*, 35, No. 1, 27; No. 2, 135; No. 3, 247; No. 4, 357; No. 5, 469; No. 6, 581; No. 7, 693; No. 8, 805; No. 9, 911 (1932).
30 *Papeterie*, 54, No. 1, 5 (Jan. 10, 1932).
31 *Papier*, 36, No. 3, 251 (Mar. 15, 1933).
32 *Papeterie*, 54, No. 15, 814 (Aug. 10, 1932).
33 *Rev. gen. mat. plastiques*, 8, No. 11, 551 (Nov., 1932).
34 *Papeterie*, 54, No. 21, 1173 (Nov. 10, 1932).
35 *Ind. Eng. Chem.* 24, 1006 (1932); Cf. also *Ibid.*, News Ed. 10, 303 (1932).
36 *Atti accad. Lincei* 15, 11 and 17 (1932).
37 *Boll. staz. sper. ind. carta e studio fibre tessili vegetali*, 11, 40 (1932).
38 *Papeterie*, 55, No. 1, 10, 13 (Jan., 1933) and No. 3, 122 (Feb. 10, 1933).

(*) The most recent book on the paper industry to be published in France is by Porphyre, *Manuel de l'industrie de la papeterie.* Paris. J. B. Balliere et fils. 300 pp. (1933).

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## Opportunity and Your Future

Your present job is your best opportunity. Your future depends on how you do your present work. If you do it carelessly or even mechanically, you will never get ahead. If, however, you will put energy into it, try to produce more than the other fellow in the plant, and give the company a new idea once in a while, your present job will soon be a stepping stone to a better job.—*Roger W. Babson.*

# Sulphate Black Liquor

## Offers Some Striking Problems to the Analyst

By R. H. STEVENS
and
R. C. WOOLDRIDGE

IN the manufacture of kraft pulp it is universal practice to add some black liquor along with the white liquor when charging the digester. Though probably this practice was originally designed to maintain the alkali concentration of the final black liquor, it is generally believed that it has a beneficial effect upon the cooking action itself. Thus the fiber strength appears to be conserved and the cooking time appreciably reduced. Just what the action of the black liquor may be has not yet been satisfactorily explained. It has been suggested[1] that this may be an instance where presence of products of the reaction helps to start the action. For example, food cooked in a saucepan in which food has been allowed to scorch will be scorched more easily than in one in which such has never occurred. Oeman[2], however, suggests an opposite effect. Instead of helping to start the reaction he thinks it partially inhibits it by exercising an appreciable restraint. He cites experimental data to show that sodium hydroxide is consumed by the organic matter of the black liquor when mixed with it and concludes that:

"Consequently when black liquor is mixed with white liquor, as is customary in cooking sulphate pulp, a chemical reaction occurs between the organic matter of the former and the NaOH of the latter whereby the concentration of the free alkali in the cooking liquor is greatly diminished. This has the advantage of lessening the severity of the action of the cooking liquor upon the fiber. As the cook proceeds, more organic matter is dissolved out of the wood and this consumes alkali. The reversibly bound sodium hydroxide becomes free and therefore available for the cooking process. The organic matter of the added black liquor therefore serves as a buffer for the free alkali."

In planning a program of research on the sulphate cooking process, the first requirement is a method of analysis of the black liquor. In the mill, the active alkali is determined by titration to phenolphthalein end point after precipitation with barium chloride. Oeman[2] objects to this because of errors caused by occlusion and displacement of the equilibrium by hydrolysis. He proposes to precipitate the organic salts with 95 per cent alcohol (by weight) in the proportion of nine volumes of the alcohol to one of the black liquor. This does congeal the organic matter and after standing for several hours a clear solution can be pipetted off. This is, however, very highly colored and difficult to titrate with indicators.

### Applicability of Various Electrodes

In order to get away from color changes it was necessary to resort to electrometric methods. The first question to arise was, naturally, what kind of electrode to use. The hydrogen electrode is the standard, but unfortunately does not function satisfactorily in the presence of sulphides. Francke and Willaman[3] proposed the use of stick antimony as an electrode for measuring pH of paper mill liquors and white water. Chamberlain[4] applied the antimony electrode to sulphate mill black liquor, but complained of a troublesome tendency to drift. We found the same difficulty but were able to reduce it considerably by carefully purifying the antimony. Even the purest antimony, however, would accumulate a coating which would cause drift requiring considerable time to stabilize. On changing such a coated electrode to another solution of different hydrogen-ion concentration the drift would begin again. And if the coating were sand-papered off and the stick placed again into the same solution another drift of potential would occur and when finally stabilized the second e. m. f. was not always identical with the first.

Roberts and Fenwick[5] described a type of flowing junction using powdered antimony and antimony trioxide in one of the electrodes. The metal must be very pure and the trioxide must be in the cubic crystalline form. This apparatus was secured and found to work satisfactorily. The electrode comes to constant potential immediately and this potential is reproducible. Unfortunately, although this set-up is very useful for determining the e. m. f. of the black liquor, it does not lend itself to titration work.

Cox[6] described a differential method of titration in which identical volumes of liquor samples are placed in two separate beakers joined by a strip of filter paper as a bridge. A pair of matched burettes are used to add a standard acid to each beaker separately. By keeping the volume of acid added to one of the beakers just a very small amount (0.1 ml.) greater than that added to the other a slight, but measurable, difference in potential is set up between them. This is measured by a potentiometer circuit connected with clean platinum wires one dipping into each solution. When neutralization is reached this potential difference exhibits a sudden rise. Another small addition of acid causes it to fall again. This method gave excellent results on black liquor, but was slow and cumbersome.

MacInnes[7] devised an ingenious apparatus by which a portion of the solution can be walled off from the rest, yet kept in contact with it through a small opening. A gas lift is used to bring about mixing of the whole solution after each reading. The gas inlet is controlled by the burette stopcock. This apparatus was secured and gave excellent results on white liquor and on weak black liquor. With strong black liquor, however, the gas lift caused foaming. This could be controlled somewhat by adding kerosene or a paraffine oil, but this resulted in formation of a troublesome emulsion.

Willard and Fenwick[8] proposed the use of polarized electrodes. Two platinum electrodes immersed in the same solution are connected with the leads of a storage battery in series with a high resistance. A current is passed through the solution for two or three minutes, setting free hydrogen and oxygen at the respective electrodes. These are then connected with the potentiometer circuit by a suitable switch and the difference in potential is measured. This is repeated after further addition of acid. When the end-point of the titration is reached there is a sudden rise in the potential. Unfortunately this is confined to a very small range of volume addition and it is too easy to overstep the mark. This method is apparently more suitable for oxidation and reduction reactions than for neutralization.

The quinhydrone electrode has been very strongly recommended for acid-alkali titrations so this was next investigated. It has the disadvantage of being unsuitable for use with strongly alkaline solutions. On this account, it was found necessary to place the black liquor in the burette and titrate into a known amount of standard acid. Working in this way we at first titrated to the point where reversal of current occurred thinking this indicated neutrality. We found, however, that when a black liquor titrated in this way was mixed with a white liquor which had been analyzed in the usual manner using indicators and the mixture was titrated using the quinhydrone electrode the amount of total alkali and of active alkali in the mixture appeared less than they should be calculating each from the separate analyses. This masking effect of the black liquor upon the white liquor is doubtless what led Oeman[2] to his theory of buffer action.

Now quinhydrone is an equimolecular combination of quinone and hydroquinone. In water these are dissociated and the hydroquinone ionizes in two steps as a dibasic acid. In solutions of pH above 8, the secondary ionization of hydroquinone begins to have an appreciable effect upon the hydrogen-ion concentration of the solution. This acid function of hydroquinone also dis-

## Analysis of Mixtures of Black and White Liquor

| White Liquor | | Black Liquor | | **Esbf. | Volume of Mixture cc. | Total Alkali Gms. per liter as $Na_2O$ | | Active Alkali Gms. per liter as $Na_2O$ | | DIFFERENCES | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Total Alkali g/l as $Na_2O$ | | Active Alkali g/l as $Na_2O$ | |
| Grams | C. C. | Grams | C. C. | | | Calculated | Found | Calculated | Found | Found | Per Cent | Found | Per Cent |
| 475 | 404.67 | 25 | 22.91 | 0.973 | 427.58 | 122.04 | 120.90 | 103.65 | 103.85 | −1.14 | −0.93 | +0.84 | +0.81 |
| 450 | 383.37 | 50 | 45.83 | 0.969 | 429.20 | 116.63 | 117.08 | 97.74 | 98.88 | +0.45 | +0.38 | +1.14 | +1.17 |
| 400 | 340.77 | 100 | 91.66 | 0.928 | 432.43 | 103.07 | 104.08 | 87.33 | 89.06 | +1.01 | +0.98 | +1.73 | +1.98 |
| *400 | 340.77 | 100 | 91.66 | 0.931 | 432.43 | 103.07 | 105.93 | 87.38 | 88.43 | +2.86 | +2.77 | +1.10 | +1.26 |
| 350 | 298.18 | 150 | 137.50 | 0.944 | 435.68 | 94.76 | 95.08 | 77.06 | 78.75 | +0.32 | +0.33 | +1.69 | +2.19 |
| 300 | 255.58 | 200 | 183.33 | 0.903 | 438.91 | 84.16 | 84.79 | 66.95 | 68.77 | +0.63 | +0.74 | +1.82 | +2.72 |
| 250 | 212.98 | 250 | 229.17 | 0.937 | 442.15 | 73.69 | 73.08 | 56.98 | 58.56 | −0.61 | −0.83 | +1.58 | +2.77 |
| 200 | 170.38 | 300 | 275.00 | 0.838 | 445.38 | 63.38 | 64.47 | 47.09 | 49.07 | +1.09 | +1.56 | +1.98 | +4.20 |
| 150 | 127.79 | 350 | 320.83 | 0.892 | 448.62 | 53.22 | 54.30 | 37.51 | 39.07 | +1.08 | +2.03 | +1.56 | +4.16 |
| 100 | 85.18 | 400 | 366.67 | 0.884 | 451.85 | 43.19 | 43.79 | 27.95 | 29.47 | +0.60 | +1.39 | +1.52 | +5.44 |
| 50 | 42.59 | 450 | 412.50 | 0.838 | 455.09 | 33.32 | 34.28 | 18.53 | 19.91 | +0.96 | +2.88 | +1.38 | +7.44 |

(*) Refluxed for 3 hours.

(**) Esbf = Electromotive force determined with antimony electrode flowing junction (Robert & Fenwick).

Total Alkali Found Gms. per liter as $Na_2O$

| | Black Liquor only | White Liquor only |
|---|---|---|
| With potentiometer | 23.58 | 127.62 |
| With methylorange | —— | 130.73 |
| With phenolphthalein | —— | 109.82 |

$= Na\,OH + \frac{1}{2}\,Na_2S + \frac{1}{2}\,Na_2CO_3$ ($Na_2O$ g/l).

Active Alkali found Gms. per liter as $Na_2O$

| | Black Liquor only | White Liquor only |
|---|---|---|
| With potentiometer | 9.28 | 108.32 |
| With methylorange | —— | 115.03 |

turbs the equimolecular proportion referred to above. Both these effects disturb the relationship between the potential of the electrode and that of the hydrogen electrode which is our standard[9]. We found that, working with a saturated calomel half-cell at 25°C., when the titration passed a point indicated by a potential of 0.044 volt, which corresponds to pH of 7.0, the rate of change of potential with addition of alkali was greatly retarded. The reversal of potential occurred at a point corresponding to a pH of 7.76.

### Results of Investigation

We have made a careful study of the analysis of mixtures of white and black liquors using the method just described —namely, titrating to e. m. f.—0.044 v. Some of the results of our work are shown in the accompanying table. The total alkali found in the mixtures agrees, within the limits of experimental error, with values calculated from separate analyses of each liquor. Thus Oeman's theory that alkali in white liquor is consumed by the addition of the black liquor is not borne out.

For determining the active alkali the method of precipitation with barium chloride followed by titration of the supernatant liquid was employed. The results in this case were always higher than the calculated values by a fairly uniform amount. This is probably due either to incomplete precipitation with barium chloride or to a progressive hydrolysis of the barium salts. That the percentage difference, in the final column of the table shows a progressive increase with increasing amount of black liquor due merely to the decreasing amount of active alkali in the mixture. That is, a fairly constant number divided by a decreasing divisor yields an increasing quotient.

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## ◆ Read to Direct Courses at Chemical Exposition

W. T. Read, Dean of the School of Chemistry, of Rutgers University, will direct the program of student courses at the Fourteenth Exposition of Chemical Industries, which will take place in Grand Central Palace, New York, December 4 to 9, 1933.

This year's program of student courses will be divided into sessions dealing with elementary chemical engineering, advanced chemical engineering, and industrial chemistry. Responsive to many requests it is believed that there will be instituted, also, a session on chemical economics or the business side of chemistry and chemical engineering.

Professor Read, who is a member of the Exposition Advisory Committee, has been chairman of these courses at previous expositions. Prior to his association with Rutgers University, he was Professor of Chemical Engineering at the Texas Technological College.

## ◆ Regulator Companies Change Name

The Mason Regulator Co., of Boston, manufacturer of automatic regulating and control equipment, and the Neilan Co., Ltd., of Los Angeles (subsidiary of the Mason Co.), have consolidated. The name of the new company is the Mason-Neilan Regulator Co.

The engineering, manufacturing and sales departments of the two individual companies have been combined at 1190 Adams Street, Boston, Mass. F. Kenneth Morrison, former sales manager of the Mason Regulator Co., will continue in this same position for the consolidated company. Douglas H. Annin, chief engineer of the Neilan Co. for several years, will serve in a similar capacity in the new Mason-Neilan Regulator Company.

This union brings under the Mason-Neilan trade-mark a complete line of automatic pressure regulating valves, liquid level controllers, as well as compensated instruments for controlling pressures, temperatures, rates-of-flow and combustion.

# Looking Backward
## With Paper Mill Management

By ARTHUR B. GREEN
Management Engineer

OLD-TIMERS can remember the day when a capable superintendent in shirtsleeves and straw hat would pass mill-worn fingers over the sheets from the night run, squint across them and peer through them expertly from behind gold-rimmed glasses, and give the final verdict on his own authority—the day when no man qualified as a papermaker if he had all his fingers and thumbs. The old superintendent has passed on. Today, in his place, there is system. Yet some of those old-timers fall to wondering whether things really run smoother today. After all, perhaps the new measurements and laboratory technology may have stirred up about as much trouble as they had quelled. Could all the returns and allowances and lost orders be fairly charged to cranky customers taking advantage of a buyers market?

Some mills had been running and generally making money before there was a technical association. The mills, or the company owning them, had belonged to the trade association for years before the pressure of the technical man had been felt in the industry. When enough mills had been running laboratories long enough to warrant chemists and engineers forming a new branch of the association, the move was watched with interest if not with misgiving. Now since all that is history, business seems harder to get than ever. More tests are weapons in the hands of the trade to belabor the mill, finer ways of saying, "This will not do." And with more technology within the mill, is there really more mill control?

When the technical association got on its feet, that which appeared to be good meat began to accumulate in the literature. Its meetings were technically rich. The financial and commercial men left them quite alone, seeming to feel that the technicians were talking a new and foreign tongue and perhaps had better not be disturbed. But the practical men felt left out. Such learning as filled the air in the technical meetings seemed to them a bit abstruse, a little removed from the real job of running a mill. So still another association was put together for the superintendents. Thenceforward the superintendents would let the technician technicalize, but they would be practical; they would keep to that which concerns mill men and paper.

One who reads the papers and discussions of these two groups would even now be curiously hard put to tell which is which without a glance at the footnote to see at what meeting it all took place. Technical and engineering subjects engross both bodies. They both talk steam and electricity, engines and motors, buildings and ventilation, beaters and pumps and refiners, machinery, and the like; they both talk lime and lime sludge, sulphur burning and acid making, waste chemical recovery, yield from wood and the prospect of new sources of fiber, pressure vessels, bleach and bleaching, waste solids and white water, corrosion-resisting materials. All purely cold technical material.

When the superintendents said that cold materialism was not all there is to running a mill, they hit on a truth. They might have pursued it. For if a mill is going to be well run; if the results embodied in the product and its cost are going to be under control; it is the men who are to be trained, inspired and directed, far above the materials and machinery. A mill well built and well equipped can easily dip into the red, as so many of them have under current business stresses, if manpower in terms of fitness, habits of work and team-play is not there; but a poorly equipped mill may yet stand a better chance—and there are some that do—when well endowed with human skill and coordinated energy.

Quite in contrast with that thought is the spectacle of the typical paper convention week: Financial and commercial men together in one place talking car loadings, prices, discounts and allowances, trade customs, mergers and tariffs, the other fellow's ethics; in another place the superintendents together talking technicalities; in a third room the cost men assembled to talk figures and statistics; the technical men in a fourth talking more technicalities; and anybody talking about how to inspire and control human beings.

So the departments of a business tend to grow into compartments of thought. They become almost water-tight, so completely do they shut themselves off from one another. But with respect to the workman, whether the business be large or small, the management has clear and simple responsibilities. It pays to give the workman the best set of instructions that modern science can devise, and to provide the best tools in the form of machinery. If this is going to be done at all, the management does it because neither the modern science nor the machinery is within the workman's means. They are none the less part of the job, if his productivity is what counts. The other part is the workman himself. That part includes selection, training, and daily and hourly leadership in the light of the best that modern science knows.

Management must take the consequences for all work that is done. If the management plans well, the chill is taken out of technology and it enters human service with high probability that the business can keep in the black.

### ◆ A Plow Invented for Reforestation

A forestry plow especially made for reforestation work is now available. The plow has been developed by Professor S. O. Heiberg, of the New York State College of Forestry, Syracuse University, in cooperation with engineers of the John Deere Plow Works and the Syracuse Chilled Plow Company.

Following in the footsteps of its cousin, agriculture, forestry is taking into its service the machine. During the last three years trees have been planted in many places by machines instead of the grub hoe and now the forestry plow appears.

It is a tractor-drawn implement which removes the sod to a depth of a couple of inches from an 18 inch wide strip and then cultivates this strip by means of spring teeth and subsoiler so the soil is in excellent shape for planting. Different combinations and adjustments make the plow equally suitable for heavy and light soils. The depth of cultivation of the cleared strip can be adjusted from very superficial scratching of the surface down to a depth of 12 inches.

The machine can be handled by the tractor driver alone as the levers are adjustable for different tractors.

Experiments conducted by the New York State College of Forestry show that with a 6-ft. spacing between the center of the strips the plow can prepare 1 to 2 acres per hour. With all expenses included, the preparation of one acre thus costs from $.75 to $1.50 or 2 to 4 times less than hand made holes, and then the strip is much better prepared than it would be economically possible to do by hand. Planting in such a strip is extremely easy and the young trees have a better chance for survival and development than if they were just planted in holes.

This plow, which is to be named the Syracuse Forestry Plow, promises to be a very useful tool for the large scale reforestation now under way in many parts of the country.

### ◆ Several United Paperboard Mills Sold

The United Paperboard Company has recently disposed of six of its plants as follows:

Peoria, Ill. mill sold to the Terre Haute Paper Co.; mill at Eaton, Ind. acquired by Ball Bros. Co.; Mt. Carmel, Ill. mill taken over by Central Fiber Products Co.; mill at Rockport, Ind., now owned by Mead Corp.; plant at Wabash, Ind., sold to Container Corporation of America; Whippany, N. J., plant taken over by Agar Corporation of New York.

◆ SAMPLES OF PAPER used in the manufacture of a paper milk bottle in Germany have been received by the Paper Division of the Bureau of Foreign and Domestic Commerce. This paper is claimed to be waterproof and especially adapted for milk bottle manufacture.

# The Maintenance Engineer

By WILLIAM TAYLOR

THE maintenance engineer occupies a peculiar position in the pulp and paper industry. He is not considered a producer, yet, to a certain extent, productive capacity depends directly upon his capacity and efficiency. The cost of his services are classed as overhead expense, which they properly are, but at times they are enlisted at as low a price as possible without regard to ability. Apparently, the thought has never occurred to the management of some mills that the post of maintenance engineer in the modern pulp and paper mill is a job for a highly trained specialist, and that all of this specialist's knowledge cannot have been gained in schools. A prominent paper mill engineer has made the statement that at least ten years of experience in a plant (or preferably plants) in a subordinate capacity, is one of the essentials for a good maintenance engineer. That this is a logical deduction is apparent when consideration is given to the essential knowledge qualifications.

Such an engineer is expected to have a broad general knowledge and experience in the fields of civil, mechanical, electrical, chemical and structural engineering, as well as specialized knowledge of power plant operation, paper mill processes and machinery, and last, but not least, a sound working knowledge of cost accounting. He must have knowledge of processes and equipment, and must be able to write concise, complete and accurate analyses and reports. He must be able to supervise the maintenance cost system and must have the vigor and personality necessary to lead his crews, and to gain and hold their loyalty, respect and co-operation. He must have a pronounced degree of personal courage. Taken altogether, it amounts to a rather large order for one man to fill completely, and it is not at all surprising that at least ten years of practical work in the industry is considered an essential for a first-rate maintenance engineer.

The necessity for his thorough grasp of the subjects mentioned is apparent when the scope of his labors is considered. For example, if a production superintendent requests that a piece of pumping equipment be repaired or renewed for the reason that the capacity is apparently too small, the engineer must first diagnose the difficulty; i. e., determine the reason, whether mechanical, electrical or process. He must then estimate the cost of repairs and by reference to his cost data, determine the maintenance cost of the equipment. An analysis of the advantages and disadvantages of repairing versus replacing the unit must be made, giving full consideration to such factors as efficiencies, cost, depreciation, cost to maintain, etc., of the old as balanced against new equipment. Assuming that the purchase of new equipment is indicated by this analysis, he must prepare a report for submission to the management to justify his requisition for an appropriation to make the purchase. Finally, he must be prepared to make the layouts for installation of the new equipment. He must also be in a position to recommend specific equipment to the purchasing department and to advise the stores department as to the spare parts to be held in stock for the equipment purchased. His responsibility is not yet ended, for when the new equipment arrives, he must be capable of supervising its erection at the lowest consistent cost.

If his analysis does not show that new equipment is desirable and that the old may be repaired to better advantage, then he must be capable of supervising and directing the men responsible for this work and always at the lowest consistent cost.

The maintenance engineer is forever on the *spot* between the management and the production superintendents. Therefore, an unusual amount of tact is required by him in order to keep both sides happy. The production men almost invariably insist that equipment be maintained in new condition, while the management insists that less money be spent for maintenance, and that it is sufficient to keep the equipment only in operating condition. As is usual, the proper course lies somewhere between the two viewpoints. Just where, is dependent upon the thoroughness with which the engineer studies the situation, upon local conditions, and upon the amount of tact the engineer possesses. Obviously, money can be spent to keep machines in new condition that will not contribute in the least to improving operating conditions or efficiencies. On the other hand, to keep machines in operating condition with an expenditure of the least amount of the maintenance dollar is done at the cost of reducing output and lowering efficiency excessively. The analysis of these factors and the ability to convince the other interested parties of the accuracy of the analysis is one of the prime functions of the able engineer.

Operators have a tendency to confuse maintenance and operation on many items of equipment. Operators do work on equipment which is in reality maintenance, and, on the other hand, maintenance men do work on machines which may properly be classed as operation. This situation contributes to misplacing costs of the two classes of work. In either case, the result is not to the ultimate advantage of the company. The engineer should be capable of accurately classifying the work to be done and should have the tact which would enable him to get the facts across to operators and management without friction.

In many plants, maintenance functions such as oiling are attended to by the individual machine operators on the theory that the operator is always there and it costs nothing to have him pause a moment and squirt a little oil or daub on some grease occasionally. Practical results show that this line of reasoning is a fallacy. It has been found that by transferring this responsibility to capable, trained oilers under the direction of the engineer, extensive savings of oils and greases may be made and also large reductions of down-time may be effected. At first sight, it would appear that the engineer has but little to gain and much to lose by such a recommendation, as he is adding the oilers non-productive labor costs to his departmental expense. A bit of study, however, will show that this is not the case, for the savings in raw materials, oils, greases, babbitt, etc., which are chargeable to his department, will more than offset the added labor costs, and, in addition, reduce the amount of maintenance work to be done. This plan offers concrete advantages to the production superintendents, as their production efforts will result in a greater tonnage produced at no increased expense due to the reduction of down-time losses and full time work from machine operators without interruptions. From the managerial end, the re-arrangement of responsibility will result in a net profit which alone will be great enough in many cases to pay the engineer's salary. The capable plant engineer should uncover and point out conditions such as have been suggested, and should never be afraid to transfer costs to his own department which are properly chargeable to him so that they may fall directly under his control. On the other hand, he must have the courage to fight any attempt to foist on him cares which are properly those of operation. It is only by taking this attitude that the engineer can build up records of maintenance which will enable him to analyze and report on equipment renewals or replacements.

The engineer should not permit maintenance work to become a habit with his crews or with his individual thought processes if economical maintenance of a plant is to be had. He should never allow it to become a matter of habit, for instance, to tear down a piece of equipment at regular intervals and make repairs merely because it is customary to do so. Of course, this assertion does not apply to repairs which may be unnecessary at the moment but are consummated over a Sunday shutdown to insure against down-time during the week. Even here, however, the need for a man with good judgment is apparent, since it may be much more economical to allow the down-time to increase slightly over the period of a year's operation than to fall under the costly spell of habitual maintenance.

At all times, the engineer must have his fingers closely on the pulse of his department. This may be accomplished

through the medium of an organization for inspection of all equipment at stated intervals by men concerned directly with its upkeep. Such inspectors have regular routes of inspection and regular schedules for following the routes. After each inspection, or at least once each day, written reports should be turned in to the engineer by these inspectors. Thus the engineer may keep fully informed as to the condition of his equipment, and, in most cases, lay plans and gather repair parts long before an actual breakdown occurs. This planning effects a considerable reduction in down-time and in maintenance costs as well.

Managerial heads of a plant are likely to conclude that because the men in an efficiently organized and capably operated maintenance department seemingly have but little work to do, the costs of maintenance are too high by the amount of wages paid the apparently idle men. Possibly the thought never occurred to some mill managers that if most of the men included in the maintenance department were idle 100 per cent of the time, that the department would be 100 per cent efficient. In other words, the more the maintenance crews are at work during operating periods, the greater the loss of production is likely to be. Down-time on a paper machine, for example, may in a few hours amount to much more than the wages paid the maintenance crew for a month.

The maintenance department, therefore, becomes primarily a sort of insurance against undue losses of production and is only secondarily charged with the responsibility of making needed repairs. If the department is organized with the sole purpose in mind of having its men available for making repairs, then an engineer is not required and a machinist could operate it satisfactorily. The prime test of an engineer's capability does not lie in the amount of work that he gets done or in the cost of doing it, but rather in the overall saving that can be made through increasing production by the elimination of down-time.

On the other hand, the engineer should not allow idlers in his department when there is real work to be done. His administration of discipline is thus complicated, and his tact and judgment are again called into play.

It is no small job to plan beforehand the work that is to be done on a week-end shutdown and get it properly done in the limited time available without calling to work more men than are actually required. Careful planning and arranging for supplies to be made available to the crews is necessary, and here experience gained through contact with many such jobs is necessary.

The far-seeing engineer conscientiously collects and classifies data relative to costs, down-time, etc., and is always in a position to present these data to the managerial heads of the plant in a concise and readily assimilated form. He thus keeps himself personally informed as to his progress and is always in a strong position during any controversy.

Operators are always prone to assume that the engineer is a sort of compendium of knowledge on the various aspects of operation as well as engineering. They are often apt to ask him to make decisions for them. If this information is precise and usable he is in position to render decisions and to maintain a close liaison with the operating forces.

When the management of a mill contemplates the installation of a new maintenance engineer, it is faced with a problem of more importance than may be indicated on the surface. It is easily within the power of the one selected to nullify much of the productive effort expended by the operating force in a manner that is not readily observable. The choice of an incompetent man may cost much more every month than could possibly be saved through the year on his salary.

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## ◆ Spotting Leaks in Boiler Settings

Every boiler setting is to some extent a sponge. Every boiler setting breathes with changing temperatures. Air is drawn into the porous brickwork as well as in through the interstices, cracks and voids in the refractory, between joints, etc., due to the vacuum in the boiler setting. Wherever the combustion of carbon or fuel is concerned, it is necessary for the oxygen of the air to be drawn into the furnace for purposes of combustion. For efficient combustion, on the other hand, it is absolutely necessary that this air be controlled, that the amount of air supplied to the furnace for combustion purpose be under close regulation and that it be delivered where wanted and in the quantity wanted. Neither of these requirements are met when air seeps in through brickwork and crevices. This explains why the air leakage or air infiltration is so objectionable.

Enormous quantities of cold air will be drawn through furnace brickwork unless some means is taken to prevent it. The result is that furnace temperatures are reduced; boiler heating surfaces are cooled; and stack capacities are lowered because of the lower stack temperature (upon which the draft depends) and carry off a large amount of excess air.

A frequent cause of smoke is leakage of cold air through the furnace, either in the back or through leaks between metal and brick or due to the porous nature of brick, joints, etc.

Loosely-fitting firing doors, broken hinges or latches, loose brick and cracks in the setting mean one thing only and that is large waste of fuel through air infiltration or air leakage. All brickwork should, therefore, be kept in good shape and should be painted with a special paint to seal up all joints and crevices of the brickwork. Once done, the job lasts a long time. It begins to pay for itself from the time it is put on and lasts a long time without attention or bother.

It is easy to locate loose brick, cracks and defective brickwork when looking for them. The tests are very simple if one does not wish to depend solely upon a superficial inspection with the naked eye. Exploration with an indicating thermometer or pyrometer will show that something is wrong. Tests made with a portable $CO_2$ indicator or gas analyzer will show air leakage, and dilution resulting in a radical change in carbon dioxide.

Frequently, however, pyrometer, thermometer or gas analyzer is not on hand and it is necessary to make tests in a more simple way with whatever equipment is available.

A lighted match will very often tell the tale. With the fire active and the boiler or stack damper wide open so as to create the maximum draft, place a match against the crack or wherever leakage is suspected. Frequently the match will be blown out altogether. Where the leakage is less severe, the flame will be seen to be drawn toward the leak. A candle is preferable for this job, since it may be moved all over the brickwork, the flame being drawn inward where the leakage is worse.

In very bad cases a sheet of newspaper may be held against the brickwork by the flow of air inward into the furnace. Another simple way to determine where the leaks exist is to build up a bright fire with the damper wide open. Then throw on a few shovelfuls of green coal and close the damper tightly. Smoke will come out wherever the leaks exist. These localities should be marked with chalk so that they may be repaired at the first opportunity.

## ◆ Import Committee Reports Progress

Attorneys formerly in the offices of the Assistant Attorney General in charge of customs are now, since the change of administration, practicing in the Customs Court on behalf of importers, according to reports of trials of paper cases in various cities coming to the Import Committee of the American Paper Industry.

"The Import Committee has always sought for a correct interpretation of the tariff laws, and no more," says Warren B. Bullock, Manager of the Import Committee, and the importers are entitled to the best talent they can secure in trying these cases. On the other hand the Import Committee is continuing to provide the Government with all the technical information at the command of the paper industry in its effort to secure the strict enforcement of existing laws as written. The new men in the Government service are working vigorously in the efforts to become acquainted with their new tasks, and are endeavoring to prove themselves at least the equals of the able men who have preceded them in this branch of the Government service.

The Import Committee reports that an appeal has been taken to the United States Court of Customs and Patent Appeals from the decision of the Cus-

toms Court on the dutiable value of Swedish kraft wrapping paper. The customs officials had held the paper to be dutiable at a value about 1 cent per pound higher than that claimed by the importers. The lower court decided, in view of testimony that the jumbo rolls sold for export were not sold in Sweden, where the customary size was testified to be counter rolls, the paper for export was dutiable at a lower value than that sold in the home market. Pending the decision of the higher court, all imported paper will be forced to pay the higher rate of duty.

The economy program at Washington is already throwing added work on the Import Committee which has been notified that data which could formerly be secured on foreign shipments can no longer be provided because of the decreased personnel available.

Investigation is being made of low priced offerings of standard newsprint and canary news at Chicago, Norwegian paper being offered at about $30 per ton, delivered at Chicago. Canary news is being offered duty paid at less than $40 per ton, also from Norway. These figures would reduce to about $23 per ton f. o. b. mill, which is apparently below any possible cost of production.

A case initiated by the Import Committee in 1926, has at last been decided by the United States Customs Court. Waxed printed paper labels were claimed to be dutiable at 3 cents per pound and 15 per cent as wax coated paper, but were classified by the Customs officials as being something more than paper, and held dutiable at 5 cents per pound and 20 per cent as manufactures in chief value of coated paper. As a result of this action, now decided after seven years, the importation of waxed paper in all printed forms was stopped.

A case instituted in 1930 involving the dutiability of Japan paper was decided adversely to the importer, as a result of the action taken by the Import Committee. The paper was claimed to be dutiable as printed (book) paper at ¼ cent per pound and 10 per cent, but was held to be dutiable at 3 cents per pound and 15 per cent under the writing paper provision of the Tariff Act, which includes Japan and similar papers.

◆ A. P. COSTIGANE has recently severed his connection with the Ontario Pulp & Paper Makers Association, of which he had been secretary-engineer for the past 17 years. Mr. Costigane is well known for his safety work among the Canadian Mills. He also participated for a time in the activities of the National Safety Council as vice president of the pulp and paper section of Canada.

◆ ARTIKS, the transparent, moisture-proof Cellophane bags, manufactured by the U. S. Envelope Company, are now being made in special sizes for silverware as a new, efficient and inexpensive protection against tarnish and rust. Tarnish is a discoloration caused by the action on silver of hydrogen sulphide, of which there is always a slight percentage in the air.

## ◆ Condenser Tube Failures Due to Corrosion

Ever since surface condensers have been in use, there have been tube failures. These tube failures are more troublesome and expensive in some localities than in others. Some condensers give more trouble than others even in the same plant and locality. For many years committees of various industries, of the condenser manufacturers and of the tube manufacturers have been working singly and together to combat and overcome the trouble. The amount of trouble encountered might be said to be in the inverse ratio of the price paid for tubing. In other words, metallurgists are able to develop an alloy which can be properly made into tubes that will stand up under the worst conditions. The price is so high, however, that such tubes ordinarily are not justified, on the basis of commercial economy.

The erratic behavior of any alloy has caused the manufacturer of condenser tubing to receive much blame, from time to time. Different condensers in the same plant, using tubes rolled at the same time from the same mill have given such different performances that it is felt, on the other hand, that in many instances the manufacturer of the tubing and the metal he uses is not to blame. While the operating engineer can do a great deal to lessen tube maintenance by the careful selection of tubing, he can probably do more by the way the condensers are operated.

Corrosion is the cause of the majority of tube failures, the corrosion being often due to the presence of air in the water. Many students of this subject feel, therefore, that the solution of the problem consists mainly of minimizing the amount of air in the water, or rather, preventing it from getting into contact with the tubes. It has been found that the more turbulent the agitation of the water flowing through the tubes, the greater the tendency for the tubes to corrode. The explanation for this probably is that the air is released in larger quantities, the more turbulent the water in its flow through the tubes. When a stream of water flows straight through a tube, smoothly, the tubes are somewhat protected from the entrained air on account of the skin or film of water held against the tube by capillary attraction. The amount of water actually coming into contact with the tubes as well as the amount of air that is available to attack the tubes is thus minimized. An examination of tubes under these conditions shows that the corrosion of the tube surface is uniform. It takes place more slowly than where turbulence exists.

Where the flow of water through the tube is turbulent, on the other hand, the entrained air forms bubbles which collect and form into larger bubbles and which collectively attack the tubes. Instead of being uniform through the tubes, corrosion is more emphasized in spots or localized places. These places, again, are localized and an engineer who has his eyes open in course of time knows each of his condensers individually and knows where the trouble will ultimately develop on each unit and which nest of tubes.

The use of a suitable alloy for the tube metal that is less susceptible to corrosion caused by air is a big factor in mitigating corrosion troubles. Another remedy, obviously, is to minimize the turbulence of the water going through the tube.

It will be obvious that turbulence of the water is not caused by the tube itself. Instead, turbulence comes about before the water enters the tube. The bore of condenser tubes is smooth. With their belled ends, the tubes offer an undisturbed channel for the flow of water and water that enters the tubes without turbulence will continue to flow through them without turbulence. It is ahead of the tubes, therefore, that turbulence is created, that is to say before the water enters the belled tube ends at the tube sheet. Many tube manufacturers maintain, therefore, that corrosion to condenser tubes is a problem that must be met by the condenser manufacturers. With this end in view, the manufacturers of surface condensers are continually striving to improve the steam distribution over the tube nest so as to create a larger effective percentage of tube surface for heat transfer. Close study is being made of the lanes and baffles, so that the removal of non-condensable gases is more effective. The result of this progress is that the capacity of a given condenser has been increased or, inversely, a smaller condenser for a given capacity suffices. The velocity of the circulating water has been increased. Condenser manufacturers are now giving more attention to the design of the condensers and pumps and piping systems so that the water at the higher velocity will flow according to the laws of stream flow.

Operating engineers can help combat the corrosion of condenser tubes by seeing that all tubes are carefully belled into the tube sheets and that all packing is carefully applied so as to minimize the breaking up of the water stream which invariably means turbulence.

## ◆ Frederick C. Farnsworth

Frederick C. Farnsworth, president and general manager of the Farnsworth Company, Watertown, N. Y., passed away suddenly at Fairview Hospital, Minneapolis, Minn., July 9, at the age of 50 years. Mr. Farnsworth, accompanied by H. M. Raub, was on a business trip when he was stricken.

Mr. Farnsworth, as head of the company which bore his name, was particularly active in developing and promoting dryer drainage systems for paper machines, and through these contacts was well known and esteemed throughout the paper industry.

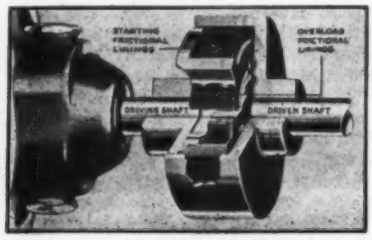
Surviving Mr. Farnsworth are his widow, a daughter and two sons.

Announcement is made that the business of the company will be carried on under the general supervision of The Bagley and Sewall Company.

## ◆ Falk-Rawson Coupling

The Falk Corporation, Milwaukee, Wis., has just announced the Falk-Rawson 4 Duty Coupling as an addition to the line of general transmission equipment manufactured by this company.

This coupling is said to make possible important savings in electric motors and control equipment. It protects the




machine or the product being made by affording smooth gradual starting and cushioning of overloads. It frequently cuts electrical bills by reducing inrush current and allowing the selection of smaller motors operating closer to their maximum capacities. In addition, it eliminates the need of shear pin couplings, fulfills the functions of a flexible coupling and in other ways adds to the economy and efficiency of the drive.

The primary function of the Falk-Rawson Coupling is as a centrifugally operated automatic starter. It accomplishes this function in extremely simple fashion. Essentially, the construction involves merely two drum-shaped members, one of which is attached to the driving shaft and the other to the driven shaft. Between driving and driven members are inserted two sets of floating segments, made usually of brake lining reinforced with lead; the amount of lead being calculated to give the required centrifugal pressure for carrying the load. The outer segments are actuated by the driving member and the inner by the driven member.

Falk Bulletin No. 500 contains complete details of this new product.

## ◆ Plibrico Observation Port

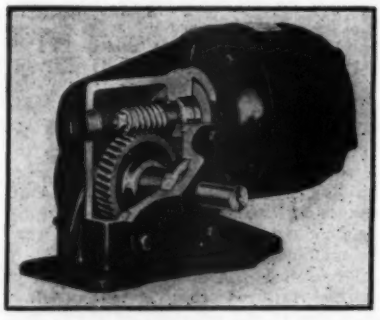
An inexpensive but efficient observation port for observing furnace conditions in boilers and other types of furnaces has been announced by the Plibrico Jointless Firebrick Co., Chicago, Ill.

The Plibrico Observation Port is provided with a divided cover which opens at a touch on the handle and closes automatically the moment the handle is released by the operator. It is impossible for the operator to leave the port uncovered allowing an inrush of excess air. The overlapping sections of the cover close tight, practically eliminating any infiltration.

As shown in the illustration, the port is also equipped with a glass to protect the eyes of the operator from possible injury. This glass is made of blue Pyrex to resist the heat and diffuse the glare.

## ◆ Fractional Horsepower Gear-Motors

A line of fractional horsepower gear-motors with the characteristics and construction of the latest designs of general purpose motors has been developed by the General Electric Company, Schenectady, N. Y. The new gear-motors combine the desirable features of light weight, efficient high-speed motor drive with a simple compact reduction gear to give almost any desired speed at the



output shaft. Connections to driven machines may be made directly or through the use of gears, belts, or chains. Full access to the gear mechanism is possible by removal of the cover plate. A liberal oil capacity and a complete lubrication system assure long life without frequent attention.

These motors are available in two types, both in ratings from one-sixth to three-quarters horsepower inclusive; the concentric shaft type, with speeds from 500 to 98 r. p. m., and the right angle shaft type, with speeds from 200 down to 11 r. p. m.

## ◆ New Rogers Automatic Knife Grinder

Samuel C. Rogers & Co., Buffalo, N. Y., has announced a new automatic knife grinder which is said to embody a number of entirely new features never before used on a knife grinding machine. This machine is made in four sizes: namely, 38, 55, 76 and 90 inches.

Each size is a completely motorized and self contained unit. By means of a special electric timing device, or clock, the grinding operation is automatically controlled. It can be set to cut off the power and stop grinding automatically at the end of any period from one to forty-five minutes. The cross feeding and grinding wheel, table traverse and shifting are also fully automatic.

The reversing mechanism includes a 60-cycle, ball bearing equipped General Electric motor with oil emersed revers-

ing and magnetic switches, together with start and push button. Power for the knife table traverse and cross feeding is from the motor shaft through a V-belt and gear arrangement, which meshes with the rack on the traveling part of the bed.

The rotation of the grinding wheel is reversed at the end of each table stroke, thus grinding the knife away from the cutting edge when running in one direction and toward the cutting edge in the other. An 8-inch diameter by 3½-inch special cup grinding wheel fitted on a ball bearing motor shaft of radial and thrust type is used for grinding.

Standard equipment also includes a belt driven centrifugal pump with valve to regulate the flow of water or cooling compound as desired, a large capacity tank, and double drain pans for delivering coolant into tank without splash or dripping off machine.

Within the base are enclosed the reversing switch, transmission shaft and pulley, gear box and water tank with pump. This design is, therefore neat and attractive.

## ◆ Improved V-Belts for Worthington Multi-V-Drive

A new and improved type of Goodyear Emerald Cord V-Belt has been announced by Worthington Pump and Machinery Corporation, Harrison, N. J., in connection with the Worthington Multi-V-Drive.

A basic feature in this new belt is a greater concentration, about the neutral axis of the belt, of the load-carrying capacity.

The tension and compression sections of the belt are composed of rubber, with layers of fabric distributed through the compression section to prevent excessive flexibility. All cords are completely embedded in the rubber to afford full insulation for the control of internal heat. The belt is molded to shape, and is completely enclosed in a fabric envelope which protects the working elements and provides a good contact surface for the V-grooved sheave. The fabric for the envelope is so cut that the threads run on the bias. The en-

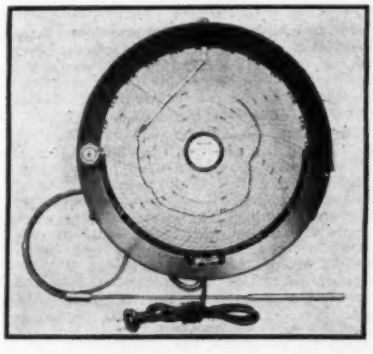
velope is flipped on the belt (not spiraled) and is so placed that the edges overlap on the top or bottom of the belt (not on the sides).

The net result of these improvements is said to be a reduction in maintenance requirements and an added period of service for each drive.

### ◆ Recording Thermometer and Pressure Gauge

A new and improved line of 8-inch and 12-inch circular chart instruments has just been placed on the market by The Brown Instruments Company, Philadelphia, Pa. These instruments include thermometers in indicating and recording types for temperatures from 40 deg. Fahr. up to 1200 deg. Fahr., and indicating or recording pressure and vacuum gauges for ranges from 10 inches of water up to 5,000 lb. All types are offered in one, two or three pen models.

In the pressure and vacuum gauges, three different types of actuating move-



ments are employed. For ranges 10 inches of water to 30 lb., a flexible metal diaphragm is used. For ranges 30 and 200 lb., a spring-opposed bellows has been developed which gives a powerful pen action in this range. For pressures over 200 lb., a helix is used.

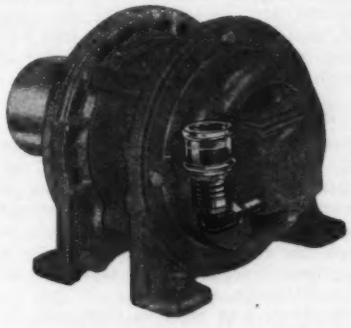
An electric clock eliminating hand winding daily is standard for all models. Where A. C. current is not available, hand-wound clocks are furnished.

Cases are of die cast non-corrosive aluminum and are interchangeable for back or bottom connection or for flush panel mounting, permitting unlimited flexibility in installation.

A new catalog, No. 6702, completely describing this new line of thermometers, Pressure and Vacuum Gauges and Liquid Level Gauges has just been issued and a copy of this book will be sent promptly upon request to The Brown Instrument Company, Philadelphia, Pa.

### ◆ Line of Automatic Oilers

The Speedway Manufacturing Company, Cicero, Illinois, has announced a line of automatic oilers. These new oilers are of two types: constant level and thermal. The constant level oilers are designed especially for use on electric motor bearings and other reservoir bearings with oil-ring, packing, or ball or roller bearings where oil in the reservoir should be maintained at a determined level, while the thermal oilers



are designed for use on sleeve bearings of the open type. Both types of oilers have a visible oil supply.

Among the claims made for these oilers are: controlled lubrication, automatic oiling, nothing to get out of order, elimination of oil dripping on the floor, large saving of time, oil and equipment, and prevention of damage to materials in fabrication.

More detailed information will be furnished by the manufacturer upon request.

### ◆ Photo-Electric Color Matcher

The Westinghouse photo-electric color matcher is a portable, comparatively inexpensive device for matching colors.

Either light or dark samples may be tested with it, the sensitivity of the unit allowing the matching of even very black surfaces. On the other hand, the range of operation is such that very brilliantly colored surfaces are within range. Condition of surface, dull or bright, does not affect the color matcher.

The optical system of the instrument is independent of daylight or external artificial light. It is made up of four



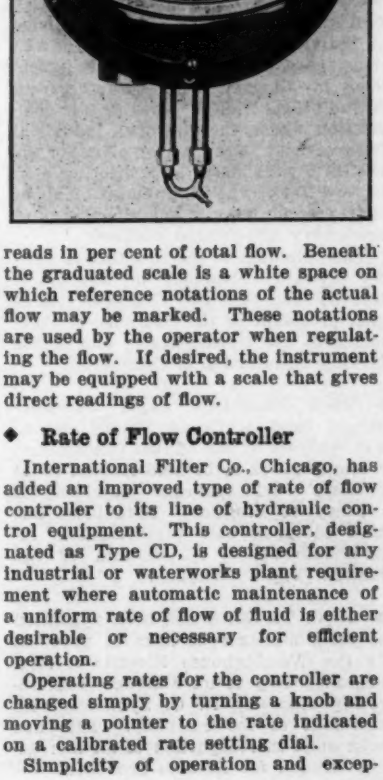
major parts: a lamp, a set of color filters, a lens and mirror, and an integrating chamber. The photo-tube is the common unit between the optical and electrical systems. The lamp is the standard concentrated filament type and is run at low voltage to insure long life. A three-color light filter permits comparison at separate color points: namely, blue, green and red. These three represent the short, medium and long wave lengths in the visual spectrum. The lens and mirror bring the light rays to the sample, and the white, integrating chamber brings the rays to the photo-tube, which has a color characteristic to give excellent operation with the lamp source.

A three position color screen permits comparison to be made between a sample and a standard in each of three bands of the spectrum, blue, green and red. In comparing a sample with a standard, each band of the color screen is used. Comparison consists of identifying the sample as lighter, darker or matching the standard in each band.

### ◆ Indicating Flow Meter

Flow can be read accurately and inexpensively with the new Foxboro Indicating Differential Gauge, according to an announcement by the company. This instrument is said to give a positive check on operating conditions, helps the operator obtain closer regulation, shows exactly what happens when flow is being regulated by hand, and eliminates the uncertain and unsatisfactory practice of counting turns on a valve.

The standard scale for the instrument




reads in per cent of total flow. Beneath the graduated scale is a white space on which reference notations of the actual flow may be marked. These notations are used by the operator when regulating the flow. If desired, the instrument may be equipped with a scale that gives direct readings of flow.

### ◆ Rate of Flow Controller

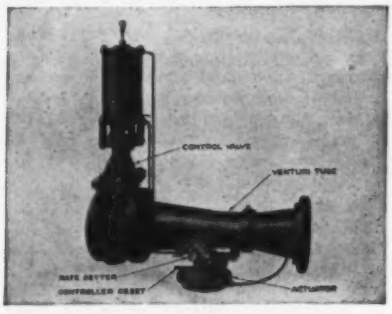
International Filter Co., Chicago, has added an improved type of rate of flow controller to its line of hydraulic control equipment. This controller, designated as Type CD, is designed for any industrial or waterworks plant requirement where automatic maintenance of a uniform rate of flow of fluid is either desirable or necessary for efficient operation.

Operating rates for the controller are changed simply by turning a knob and moving a pointer to the rate indicated on a calibrated rate setting dial.

Simplicity of operation and excep-

tionally rugged construction assure continuous operation without annoying adjustment and repair.

Loss of head through the standard controller is but a fraction of a foot at




normal flow, an important advantage in filter plant operation.

A 16-page illustrated bulletin describing this controller will be supplied by the manufacturer upon request.

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## ◆ Organize Machinery and Allied Products Institute

A new association known as the Machinery and Allied Products Institute has been formed, with headquarters at 221 N. La Salle Street, Chicago.

This institute (MAPI for short) is a federation of trade associations in the field indicated by its name. It has been organized to co-ordinate the interests of manufacturers of machinery and allied products in their relations with the National Recovery Administration at Washington. Without attempting to deal in detail with the specific problems of individual trade associations, MAPI is designed to handle the common problems of all machinery manufacturers in the preparation of codes of fair competition under the National Industrial Recovery Act. Preliminary plans for the Institute were made at a meeting held in New York June 23, attended by about 60 representatives of manufacturers of machinery and related products.

The president of the Institute is John W. O'Leary, president of Arthur J. O'Leary and Son Co., Chicago. He is past president of the Chamber of Commerce of the United States and of the Chicago Association of Commerce.

◆ THE BLANDIN Paper Company School band of Grand Rapids, Minn., will compete in the annual Chicagoland Music Festival to be held August 19 in Soldiers' Field, Chicago, adjoining A Century of Progress. This band has been equipped with uniforms and instruments by C. K. Blandin of the Blandin Paper Company.

◆ H. C. THOMAS has been appointed as sales manager of Micarta products by the Westinghouse Electric & Mfg. Co., according to an announcement recently made by N. G. Symonds, vice president of the company. This has been done in recognition of an increasing demand for Micarta products.

◆ F. W. YOUNG announces the formation of The Pulp Filter Co., with offices and laboratory at 44 Main Street, Orange, N. J. This company will manufacture filters, deckers, pulp washers, save-alls, etc., exclusively for the pulp and paper trade. Mr. Young was formerly treasurer and general manager of Filtration Engineers Incorporated.

## ◆ F. W. Peek, Jr.

Frank W. Peek, Jr., chief engineer of the Pittsfield, Mass., works of the General Electric Company and one of the company's specialists in high-voltage work, met with a fatal accident July 26 when his automobile was struck by a train near Gascones, on the Gaspe peninsula of Canada.

Mr. Peek was born in California in 1884. He was a graduate of Leland Stanford University and received the degree of master of electrical engineering at Union College. In 1905, Mr. Peek became an employee of the General Electric Company. He was probably best known, both to the electrical engineering profession and the public, by his work in the field of lightning research. He had continued much of the general line of investigation begun in the early years of this century by the late Charles P. Steinmetz, under whom Mr. Peek worked for a period during the early part of his career.

◆ THE HOWARD Paper Co., Urbana, Ohio, announces the appointment of the Barton Duer & Koch Paper Co., Washington, D. C., as its distributor handling Howard and Maxwell Bonds. Some time ago this company also took on the Satterthwaite-Cobaugh Co., Philadelphia, as a third Howard Bond distributor in that city.

## ◆ Bureau of Standards Activities Reduced

Owing to extensive reduction in its funds for the fiscal year starting July 1, 1933, which is more or less general throughout the Government departments as a part of economy measures, the Bureau of Standards will necessarily greatly curtail its activities and discontinue some of them entirely. This will make available for industry a large number of scientists who have had highly specialized training in fundamental chemical and physical research problems, and technologists who have had close contact with a large variety of manufacturing and other industrial problems.

Provision is being made by the American Standards Association, of which the Bureau of Standards is a member body, for continuity of technical projects. A skeleton staff will be maintained in the discontinued divisions and sections of the Bureau during the transition period.

Individual projects in standardization and simplification will be carried on without any essential change in method, according to an announcement by Howard Coonley, president of the American Standards Association.

## ◆ New Catalogues and Publications

**American Sheet and Tin Plate Company,** Pittsburgh, Pa.—A very attractive 23-page booklet just issued is devoted to this company's stainless and heat resisting steel sheets and light plates. The material in this booklet has been compiled to aid in the selection of the proper steel alloy. Each type is taken up separately. The booket contains several pages of illustrations. Copies will be sent upon request to buyers and users of sheet metal products.

**Bakelite Corporation,** Bound Brook, N. J.—In answer to the oft repeated question "What is Bakelite?" this company has prepared a brochure entitled "The Versatile Service of Bakelite Resinoid." This booklet sketches very briefly in nontechnical style the origin, manufacture and industrial applications of many types of Bakelite products created from the initial resinoid.

**Fafnir Bearing Co.,** New Britain, Conn.—Paper mill engineers and superintendents should be interested in this company's new paper and pulp mill catalogue just received. The use and application of Fafnir ball and roller bearings to equipment in the paper mill is set forth in a very concise manner. The text is well arranged and supplemented with a large number of illustrations and drawings.

**General Electric Co.,** Schenectary, N. Y.—Bulletin GEA-1765 contains descriptive matter on the G-E Fractional-Horsepower Gear-motors. Diagrammatic illustrations are shown of the two types: the concentric-shaft and the right-angle-shaft.

**Link-Belt Co., Chicago** — "Illustrating the Growth of an Idea" is the subject of the Souvenir Book 1933 used by this company at its exhibit at A Century of Progress exposition, Chicago. The Foreword is reminiscent of the fact that the company, with its 16 plants and warehouses, shown on centerspread pages, has grown from a simple idea that came to William Dana Ewart, the inventor of the square detachable chain-drive link, some 60 years ago. The company will mail copies in response to requests on a business letterhead.

**Metropolitan Life Insurance Co.,** One Madison Ave., New York—The subject of the older employee in industry and what business executives are doing to solve this problem is told in a new report by the Policyholders Service Bureau of this company. This report is the result of a questionnaire to 5,000 manufacturing companies. The supply of these reports is limited but copies will be sent so long as the supply lasts to any one interested in the subject.

**Nash Engineering Co.,** South Norwalk, Conn.—A new catalogue of Nash pumping equipment has just been received. This is the first time that all of the equipment manufactured by this company has been included under one cover. Several entirely new developments are shown, including the staged Nash Compressors and Vacuum Pumps for higher pressures and vacuum.

**Northern Equipment Co.,** Erie, Pa.—Booklet No. 133, illustrates and describes the Copes double control regulator. In addition to the descriptive material, there is a section devoted to some records of performance of this regulator.

**Joseph T. Ryerson & Son, Inc.,** Chicago—This company has just published a larger and more complete stock list than its previous issues. The book contains over 200 pages and includes complete information and data on practically every kind of steel that is made. Copies will be sent upon request when written on business letterhead.

**Taylor Forge & Pipe Works,** Chicago—This company is introducing a new line of lightweight fittings of No. 10 gauge steel for use with light wall piping and Taylor Spiral Pipe. A new bulletin, No. 33-5, is devoted to descriptive matter and illustrations of these fittings.

# POWER

## GENERATION + UTILIZATION + MAINTENANCE

**This section turns the searchlight on power and its allied problems, showing big possibilities to save. Opportunities to improve conditions, methods, apparatus will be discovered. Worth while practices suggest new ideas and wider usages of equipment.**

By W. S. JOULE

### ◆ Importance of Equipment Records

So long as equipment functions properly, it is enough to supervise and operate it. When it gets out of order, breaks down or perhaps burns out as sometimes happens in the case of electrical equipment, it then becomes immediately of vital importance to be able to specify accurately and precisely the part which must be replaced. In the case of electrical apparatus, very often the name plate or serial number of part is destroyed under the influence of heat or similar damage. If the plant where the accident has occurred is far removed from a city or a local branch of the manufacturer furnishing the machine, numerous telegrams back and forth may be required before the manufacturer is able to identify the exact part and furnish a replacement. For this reason, it is often worth while to card-index every piece of apparatus.

For example, in the case of a direct current generator, the engineer should prepare a card giving the name of the piece of apparatus, entering all data on the name plate such as voltage, current, speed, serial number, date of order, date of delivery, name, builder, etc. On the back of the card the engineer should, if at all possible, enter such basic information as: armature resistance; cold resistance; resistance of shunt and series winding; resistance of shunt resistance; and resistance of the series shunt and possibly the inductive shunt where commutating poles are installed. Should an accident occur, it is then a simple matter to order the part from the manufacturer or have them made up locally.

In some instances it is necessary to thoroughly blow out windings at least once a year. In such cases it is often useful to know the resistance of the windings when the machine is new and old. If the same measurements are taken once a year or oftener, it becomes possible to check up on these conditions. In some instances turns short-circuit, thus calling for more and more current for excitation. As a result, heating increases, with a tendency to damage insulation. The amount of power required for excitations is increased. The voltage characteristics of the machine become worse. The maximum capacity which it can carry for a given terminal voltage decreases. The conditions causing this are immediately brought to light when the resistance is found to have decrease . . . which only a record can show.

The same card, containing the above information and other information which will suggest itself, can also carry a column showing when the machine was last cleaned or repaired. In this way no machine needs to be neglected or overlooked; nor, on the other hand, given too much attention.

There are so many different kinds of equipment that it is impossible to outline all of the information that should be entered on such a card. However, certain facts are fundamental. One side of the card should contain all of the name plate data, together with the location of the machine, the date of installation and preferably by whom installed. Other technical information as to the various characteristics of the different parts, the troubles, how and when they were remedied should be entered on the other side of the card. Where work is done, the nature of the work should be briefly described and the name of the individual doing it or supervising it should be put down. In short, let each card contain a complete history of the piece of apparatus.

### ◆ Packing of Turbine Shafts

Badly fitted packings on turbine shafts are the cause of loss through steam leakage in a high-pressure unit and loss of vacuum in low-pressure, condensing units; also of heating, cutting of shafts and vibration. The carbon rings of shaft packing should be a good fit in their grooves and be free to change their positions due to expansion and contraction of the turbine casing. Too loose a fit allows rust and sediment to form between the rings and the sides of the grooves. The bore of the rings should not exceed the diameter of the shaft by more than 0.002 in. to 0.003 in. per in. of shaft diameter. The joints between the segments should have a good bearing over their whole surface. The springs should be examined to see whether there is sufficient tension to keep the ring firmly together. The stops to prevent the rings from turning with the shaft should be in good condition.

To test out the side clearance, a set of feelers can be used, while the bore can be checked with a micrometer if the segments are assembled on a flat surface and held together with their springs. It is a good plan to have a short piece of pipe or shaft turned to the size of the turbine shaft to use in fitting together carbon packing rings. Old rings too large for the shaft, if not broken, can be refitted for much less than the cost of new rings, by filing off the ends and so reducing the diameter of the bore. If the rings are worn too much to make a good fit in this way, more material can be taken off the ends and the rings re-bored, always bearing in mind the necessity of having the ends faced up true.

Drains in the packing cases should always be well cleaned out whenever possible, as the condensation from leakage when the turbine is not in service may cause corrosion of the shaft under the rings and this roughened surface will wear the rings quickly. Metallic packing rings, sometimes called labyrinth rings, are often used. In some cases, the ordinary type of gland and stuffing box is used with braided metallic packing. This packing, if it has become hard, should be replaced.

In fitting new packing, which is generally molded to shape, it is best to open this out in a spiral form to spring it over the shaft in order to avoid as much as possible distortion at the middle of the packing, or it can be cut in two segments and the joints of the successive rings staggered. Of the several design of packings and supporting springs each has its own peculiarities which the engineer must handle as the circumstances require.

### ◆ Essential Furnace Instruments

While an experienced fireman can approximate the condition of a fire by looking into the furnace, the average man cannot do so, and without the aid of indicating or recording instruments it is difficult to obtain even a fair measure of economy. The following instruments are recommended, but the selection or adoption of these will necessarily be governed by the size of plant and the operating conditions in general.

1. Draft Gauge indicating the draft above the fuel bed.
2. Draft Gauge indicating the draft at the rear damper.
3. Draft Gauge indicating the pressure below the grate if forced draft is used.
4. A hand Orsat or an indicating and recording $CO_2$ instrument (the latter is preferable) so connected that each boiler can be checked up, or a separate instrument for each boiler.
5. A thermometer on the exit gas.
6. Steam-flow meter for individual boilers.

These instruments should be installed wherever the size of the plant warrants and should be backed up by intelligent supervision and a definite plan of records.

# A. P. & P. A. Adopts Code

## General Code of Fair Competition now Prepared for the Paper, Paperboard and Pulp Industry

OFFICERS of the American Paper and Pulp Association, members of the Executive Committee and members of the Association, members of the Code Drafting Committee, and presidents, chairmen, or authorized representatives of Divisional Associations, met together at the Waldorf Astoria Hotel in New York City, July 26, to consider the formation of a General Code of Fair Competition to govern the paper, paperboard and pulp industry.

As a result of that meeting, the following Code has been adopted to effectuate the policies of Title I of the National Industrial Recovery Act.

### ARTICLE I—Definitions

The words used herein are hereby defined as follows:

*Industry*—The manufacture in the United States of all paper, paperboard and pulp, and the conversion thereof into such other products as are specifically included in one of the divisions enumerated in Schedule A. (Not yet completed.)

*Member*—A person engaged in such industry.

*Division*—An autonomous division or section of the industry.

*Paper Industry Authority*—The Body herein created charged with authority to administer this code.

*Act*—The National Industrial Recovery Act.

*Administration*—The National Industrial Recovery Administration.

*Administrator*—The National Industrial Recovery Administrator.

*Person*—Includes partnerships, corporations and associations, except associations not for profit.

### ARTICLE II—Administration

1—The industry is hereby divided into divisions as set forth in Schedule A. (Not yet completed.)

2—New divisions may be created only with the consent and approval of the Paper Industry Authority. If at any time any question shall arise as to whether a particular product of the industry or the manufacture or sale thereof falls within the jurisdiction of one or another divisional association or divisional code, the Paper Industry Authority shall have power to determine such question.

3—Each such division shall have its own organization and shall be self-governing as to all matters not covered by this code.

4—Each such divisional organization shall submit, through the American Paper and Pulp Association, the proponent of this code, a divisional code which shall be subordinate to this code and which shall be submitted by the American Paper and Pulp Association to the President of the United States, either simultaneously with the submission of this code or subsequently thereto. Such divisional codes shall specifically recognize this code and shall contain no provisions inconsistent therewith, unless the same shall be approved by the Paper Industry Authority.

5—If and when any division of this industry shall desire to make complaint to the President of the United States, pursuant to the provision of Subdivision E of Section 3 of the Act, that any paper, paperboard or pulp is being imported into the United States in substantial quantities or in increasing ratio to domestic production of any competitive paper, paperboard or pulp, and on such terms or under such conditions as to render ineffective or seriously to endanger the maintenance of this code, or of any code subordinate hereto, such division shall formulate such complaint and deliver the same to the PAPER INDUSTRY AUTHORITY, which shall transmit such complaint to the President of the United States.

### ARTICLE III—Paper Industry Authority

1—There is hereby created a body to be known as the Paper Industry Authority which is charged generally with the duty of administering this code and shall have such other powers and duties as are hereafter prescribed.

2—The Paper Industry Authority shall consist of Executive Committee of the American Paper and Pulp Association and of three additional members designated by the Administrator; members so designated shall have no vote but in all other respects shall be members of said Paper Industry Authority.

### ARTICLE IV—Wages and Hours

1—On and after the effective date of this code, the minimum wage that shall be paid by employers in the industry to any of their employees—except apprentices (during a six weeks' apprenticeship) semi-pensioners and wood's labor shall be

(a) Northern Zone, which shall consist of all of the territory of the United States except the States named in subdivisions (b) and (c).
Male labor 35 cents per hour
Female labor 30 cents per hour

(b) Central Zone, which shall consist of the States of Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee and North Carolina, and the District of Columbia.
Male labor 32½ cents per hour
Female labor 27½ cents per hour

(c) Southern Zone, which shall consist of the States of South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas and Texas.
Male labor 30 cents per hour
Female labor 25 cents per hour

2—Employers shall not reduce the rate of compensation per hour for employment now in excess of the minimum rates above specified. It shall be a function of the Paper Industry Authority to observe the operations of these provisions and to recommend such further provision as experience may indicate to be appropriate to effectuate their purpose.

3—No minors under sixteen (16) years of age shall be employed in the industry.

4—No employer shall employ any employees included within the provisions of Section 1 of this Article, except those acting in executive or supervising capacities and salesmen and office and research employees to work more than eight (8) hours in any day or an average of more than forty (40) hours per week in any six months' period, January 1st to June 30th or July 1st to December 31st.

(a) Workers may be employed without regard for the provisions of this code when necessary to protect property in case of fire, flood or other Acts of God, or any emergency repairs and in very special cases where restriction of hours of highly skilled workers on continuous processes would unavoidably reduce production. Any emergency time shall be reported monthly to the Paper Industry Authority.

(b) The time of workers spent in wash-ups, changing wires and machine clothing, or otherwise, while the mill (or the machinery in connection with which such workers are regularly employed) is not operating shall not be included in the permissible maximum hours of such workers. Reports of such time shall be made to the Paper Industry Authority as it shall determine.

(c) If, in order to comply with the provisions of this code, with respect to maximum hours, it shall be necessary for any mill to go from a two to a three tour basis in machine operation, such mill shall have thirty (30) days after the effective date of this code as a training period during which it shall

be exempt from the above requirement as to maximum hours of employment with respect to the operation in question. Any individual mill may also be exempted from the above requirement as to maximum hours of labor to such extent and for such limited period as may be necessary to train additional employees in order to comply therewith or as may be necessary as a result of a local housing shortage, making it impossible to procure the additional labor necessary to comply with such maximum hours. Before any deviation of this section of the code shall be allowed, a permit shall be obtained from the Paper Industry Authority.

5—The maximum hours of labor for office and research employees in the industry shall be an average of forty (40) hours per week, over each period of six (6) months, January 1st to June 30th, July 1st to December 31st.

6—Employees working on piecework or hourly basis shall not be employed more than the maximum hours of work nor receive less than the equivalent of the minimum hourly rates of pay provided in this code. No subterfuge shall be used to exempt pieceworkers and/or others from the provisions and benefits of this code.

7—The provision for maximum hours for labor shall establish a maximum of hours for labor per week for every employee covered, and no employee shall be knowingly employed by one or more employers in the industry in the aggregate in excess of the number of hours permitted in accordance with the provisions of this code.

8—All employees in the industry shall have the right to organize and bargain collectively through representatives of their own choosing and shall be free from interference, restraint, or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection.

9—No employee in the industry and no one seeking employment shall be required as a condition of employment to join any company union or to refrain from joining, organizing, or assisting a labor organization of his own choosing.

10—All employers in the industry shall comply with the maximum hours of labor, minimum rates of pay and other conditions of employment approved or prescribed for the industry by the President of the United States.

### ARTICLE V—Operations

1—With a view to effectuating the policy of the Act, the Paper Industry Authority shall make studies and formulate plans to equalize production with demand and shall from time to time make recommendations in relation thereto and may propose agreements or amendments to this code designed to carry such recommendations into effect. The Executive Authority of the divisional organizations may formulate such plans as they may determine to equalize production and demand in such division, and may include same in their subordinate codes or present the same to the Administrator through the Paper Industry Authority.

2—Each member shall, forthwith, register with the Paper Industry Authority all of his productive machinery, and shall furnish such other information as to location, age and condition of such machinery and the extent to which it has been operated in recent years, and as to the kind or type of product or products which are now being produced on such machine as the Paper Industry Authority may require.

3—Subject to review by the Administrator, the Paper Industry Authority shall have the right to determine whether and to what extent any such machinery may be properly classed as productive machinery; or to the classification by products of such machinery and if registered in more than one classification, the percentage of total capacity in each classification.

4—Prior to

(a) the installation by any person engaged or intending to engage in this industry of any paper or paperboard machine or pulp digester or grinder not now under contract or in the process of installation, except for replacements without substantial increase in productive capacity, or

(b) the shifting of the production of any paper or paperboard machine or pulp mill from the product or products for which it has been registered as herein required to another product for which it has not been registered, except in substitution for the product of another machine or machines or mill of substantially equal capacity making such other product, provided that the machine or machines or mill for which substitution has been made, shall not thereafter be operated on such other product without the certificate herein required and provided that the machine or machines or mill substituted shall be registered as required herein,

a certificate shall first be obtained from the Administrator that such installation or such shifting of production will be consistent with effectuating the policy of the Act during the period of the emergency.

5—Application for such certificates shall be filed with the Paper Industry Authority which shall transmit them to the Administrator after ten (10) days' notice to the Executive Authority of the divisional organization covering the product for the production of which it is intended to install such machinery or to which such machinery is to be shifted. The Executive Authority of such divisional organization may transmit its recommendations upon such application to the Administrator.

### ARTICLE VI—Conditions of Sale

1—The selling of any product except rejected or damaged merchandise or "seconds" (in divisions of the industry in which the sale of "seconds" is an established practice) and discontinued lines of merchandise and except in fulfillment of bona fide contracts existing on the effective date of this code, below the average weighted cost as determined on the basis of uniform principles of accounting shall constitute unfair competition. "Cost" is defined as including all cost to the time of delivery to the buyer, including among other items all materials, waste and broke, cost of rejections, allowances and "seconds," labor and overhead as well as all charges, such as interest on capital invested, salesmen's, and agents' or brokers' commission, depreciation, depletion, obsolescence, and proper reserves. Rejected or damaged merchandise and "seconds" and discontinued lines of merchandise shall be sold on such uniform discount basis as may be established as customary by the divisional association within whose jurisdiction such product falls.

2—Principles for a comparative and uniform accounting will be adopted by the Paper Industry Authority as soon as practicable, and when adopted will be used as the basis of determining minimum prices. To facilitate the determination and adoption of such uniform accounting, the members of the industry shall apply to the Paper Industry Authority, such information as may be called for by such Paper Industry Authority.

3—Each divisional organization may determine in accordance with such principles, the cost of manufacture of each product and file same with the Paper Industry Authority, and pending the adoption of such principles each divisional organization may determine such cost on the basis of such data as is presently available. The cost so determined shall be the minimum price below which the products shall not be sold except as provided in Section 1 of this Article and such costs as from time to time determined by a divisional organization shall be supplied to all members of such division.

4—The following are declared to be fair methods of competition and are hereby approved:

(a) The discussion and/or open publication of full and complete price lists and terms of sale circulated by seller to the industry, his competitors, purchasers, governmental departments, trade publications, and/or any association interested, and the adherence thereto until published notice of change in price similarly circulated.

(b) The adherence to uniform forms of contract approved by the divisional organization, including therein all of the uniform clauses from time to time approved by the respective associations concerned.

5—Members shall not supply or sell to distributors, agents,

brokers and other wholesale agencies which do not observe the Trade Customs, the minimum mill or minimum resale price (if any) of the divisional associations, prevailing from time to time as determined by the character of the sale.

6—Bona fide export sales shall be exempt from the provisions of this Article.

**ARTICLE VII—Reports and Statistics**

1—The Paper Industry Authority shall require the members from time to time to furnish such information as it shall deem to be necessary for the proper administration of the code. Failure of any member promptly to furnish information required by the Paper Industry Authority and substantially in the form prescribed by it shall constitute a violation of the code. The Paper Industry Authority shall not require any information regarding trade secrets or the names of the customers of any member.

2—Any or all information furnished to the Paper Industry Authority by any member shall be subject to checking for the purpose of verification by an examination of the books and accounts and records of such member by any disinterested accountant or accountants or other qualified person or persons designted by the Paper Industry Authority and shall be so checked for such purpose, if the Paper Industry Authority shall require it. The cost of each such examination shall be treated as an expense of administering the code; provided, however, that, if upon such examination any such information shall be shown to have been incorrect in any material respect, such cost shall be paid by the member which furnished such information.

3—To the extent that the Paper Industry Authority may deem that any information furnished in accordance with the provisions of the code is of a confidential character in the interest of the member which shall have furnished it and that the publication thereof is not essential in order to effectuate the policy of Title I of the Act, such information shall be treated by the Paper Industry Authority and by the other members, if any knowledge of it shall have come to them as strictly confidential; and no publication thereof to anyone or in any manner shall be made other than in combination with similar information furnished by other members, in which case the publication shall be made only in such manner as will avoid the disclosing separately of such confidential information.

4—All reports and statistics shall be at all times available to the Administrator, and the Paper Industry Authority shall from time to time furnish the Administrator with such reports and statistics as he may require. Copies of such reports may be furnished to the divisional associations.

**ARTICLE VIII—General Provisions**

1—If any member of the paper, paperboard and pulp industry is also engaged in any other industry, the provisions of this code shall apply to and affect only that part of his business which is included in the industry.

2—If any provision of this code is declared invalid or unenforceable, the remaining provisions shall nevertheless continue in full force and effect the same as if they had been separately presented for approval and approved by the President.

3—This code and all the provisions thereof are expressly made subject to the right of the President, in accordance with the provision of Clause 10 (b) of the Act, from time to time to cancel or modify any order, approval, license, rule or regulation, issued under Title I of said Act, and specifically to the right of the President to cancel or modify his approval of this code shall apply to and affect only that part of his approval thereof.

4—The Paper Industry Authority shall have power to investigate all alleged violations of this code and to make recommendations in relation thereto to the Administrator.

5—Upon recommendation of companies owning pulpwood timberlands in the United States, the Paper Industry Authority may formulate and present to the industry recommendations with respect to the principle of maintaining pulpwood timberlands in good growing condition, with respect to such practices of conservation as may be found practical if such practice is based on adequate fire protection through participation of public agencies and with freedom from confiscatory taxation, and with respect to the adoption of fair regulations to govern pulpwood operations as distinct from lumber operations.

6—In the event that there shall be produced in two or more divisions products which are competitive with each other and that the governing organizations of such divisions shall be unable to agree on a plan for the regulation of the production of such products or shall submit subordinate codes containing inconsistent provisions for such regulation, the Paper Industry Authority may formulate a rule in relation thereto and submit the same for approval of the President, and such rule when so approved shall have the same force and effect as though it were contained in this code.

7—Some mills and timberlands in Canada are owned or controlled by members of the industry. The operation and the sale of the products of such Canadian mills and the administration and operation of such Canadian timberlands is not to be subject to this code by reason of that fact, or by reason of their subscribing to this code, to any greater degree or in any different manner than the operation or the sale of the product of other Canadian mills or the administration and operation of other Canadian timberlands is subject to this code.

8—This code shall become effective on the second Monday after the date upon which it shall be approved by the President of the United States.

**ARTICLE IX—Amendments**

Proposed amendments to this code may be presented by the Paper Industry Authority for the consideration of the divisional organizations and when adopted by the vote of the representatives of two-thirds (⅔) of the divisional associations in number representing at least two-thirds (⅔) in value of the product of all of the divisions as determined by the latest survey of the United States Bureau of the Census and when approved by the President, such amendments shall become a part of this code.

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## American Paper and Pulp Association Reorganized

Members of the various associations representing groups of manufacturers that come under the General Code of Fair Competition for the pulp and paper industry, met at the Waldorf-Astoria Hotel, New York, on July 26.

The purpose of this meeting was to discuss and act upon the tentative code for the industry, a copy of which had previously been mailed to all members, and which was published in full in the July issue of THE PAPER INDUSTRY.

The meeting resulted in the preparation and adoption of a final code by which the industry expects to be governed. The text of the code appears in full on the preceding pages of this issue.

Another purpose of the meeting was the reorganization of the American Paper and Pulp Association. Copies of the new constitution and by-laws which were adopted at this meeting are now available. Officers were elected under the reorganization as follows:

President—S. L. Willson, American Writing Paper Co., Holyoke, Mass.

First Vice President—J. D. Zellerbach, Crown-Zellerbach Corporation, San Francisco, Calif.

Vice President—George H. Mead, The Mead Corporation, Chillicothe, Ohio.

Vice President—D. C. Everest, Marathon Paper Mills Co., Rothschild, Wis.

Vice President—Norman W. Wilson, Hammermill Paper Co., Erie, Pa.

Vice President—H. W. Ellerson, Albemarle Paper Mfg. Co., Richmond, Va.

Vice President—A. R. Graustein, International Paper Co., New York City.

Executive Secretary—Charles W. Boyce, 370 Lexington Ave., New York City.

# Tests in Libraries by Bureau of Standards

AS a part of its testing of 229 old books, that had been stored in various public libraries, the Bureau of Standards has found, as in the case of old newspapers previously examined, that the papers containing the purer fibers were in the better condition. The papers were composed of rag, straw, and wood fibers, either alone or in mixtures. Those containing the chemically treated rag and wood fibers were generally undiscolored and apparently had retained their strength well, while papers containing crude straw and ground wood fibers were generally brittle and discolored.

The publication dates of the books ranged from 1779 to 1930. The papers were composed of rag fibers until 1867. From this date until 1875 many consisted of rag with various mixtures of straw and chemically treated wood fibers. The first ground wood fibers were in a book published in 1875, and these fibers were found, largely in various mixtures with other fibers, quite extensively until around 1910, therefore the permanence of papers in books published during this period is open to suspicion. The oldest paper made entirely of chemically treated wood fibers was in a book dated 1889. In several books there was a mixture of the poorest grades of papers with the best grades, which explains some of the uneven deterioration of pages often observed in old books.

It was also found that air passing into libraries can be readily cleansed of acid gases. Since previous work at the bureau had shown that air polluted with acid fumes resulting from combustion of fuels is a deteriorant of papers stored in libraries, an experimental study was made at a Washington library of means of removing the acid. This can be accomplished, of course, only where air conditioning is practiced. In such treatment the air is washed with water, and by adding sufficient sodium compounds to the wash water to maintain a fixed alkalinity, complete removal of acid from library air containing as much as 0.42 parts sulphur dioxide per million was effected. Without alkaline treatment, the wash water removed practically no acid from the air. An added advantage of the use of the alkaline wash water is that it retards corrosion of the conditioning equipment. This is important because in absence of such treatments, the acid in the air of highly polluted areas has necessitated large replacements of conditioning equipment within less than a year's use.

Rubber cement is sometimes used in public libraries to fasten papers containing valuable records in scrap books or other protective holders. It appears to be a very convenient and generally suitable adhesive for this purpose, but a question was raised by a librarian as to the possibility of its having a deteriorative effect on paper, and the Bureau of Standards was asked for its opinion. Examination of the type of cement in question disclosed no ingredients considered harmful to paper, but tests were made by coating sheets of paper with the cement, subjecting them to accelerated aging by heating in air, and then testing the papers for loss of strength. Since the strength of the papers was practically unaffected, it was concluded that the cement would have little deteriorative effect. The adhesiveness of the cement, however, was destroyed by the treatment, indicating that in time it would need renewal.

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### ♦ A Mile of Paper Signatures

One of the popular signature securers at *A Century of Progress*, Chicago, is the mile-long roll of paper at The Paper Foundation exhibit in the Graphite Arts Division.

Up to July 18, exactly 22,665 had signed their names and addresses on the roll that will be forwarded when complete to Congress with a petition for two cents postage.

The roll, 7½ inches wide and containing a mile of paper, was donated by George H. Gerpheide, president of Hawthorne Paper Company, Kalamazoo. It is Uncle Sam Bond, a watermarked rag content sheet.

According to Phil A. Howard, President of The Paper Foundation, approximately 150,000 people have visited this exhibit since the opening of the exposition.


*Mr. Superintendent ... Look at this felt. It has had twice the service as the one shown below. But it was used as a felt and not as a belt*

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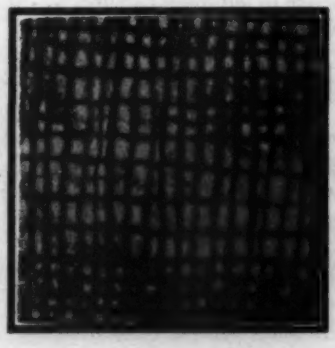

*Used with an Enterprise Compensating Drive, this felt would have had an entirely different story to tell ... Write for full details... no obligation*

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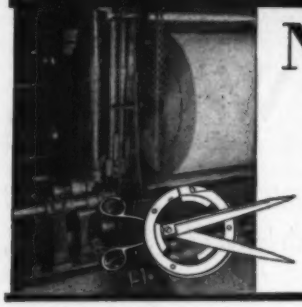

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# The Paper Industry Safety Contest

**July 1, 1932, to June 30, 1933**
**Scores as of June 30, 1933**
**11 Mills Finish with Perfect Scores**

**PERFECT SCORES**

**Division I—Paper and Pulp Mills**

| | PARTICIPANT | MILL | LOCATION |
|---|---|---|---|
| GROUP A | | | |
| GROUP B | St. Croix Paper Co. | Woodland | Maine |
| GROUP C | Cornell Wood Products Co. | Cornell | Wisconsin |
| | Consolidated Water Power & Paper Co. | Appleton | Wisconsin |
| GROUP D | Port Huron Sulphite & Paper Co. | Sulphite | Port Huron, Mich. |
| | U. S. Gypsum Co. | No. Kansas City | Missouri |
| | International Paper Co. | Livermore Falls | Maine |
| | International Paper Co. | Riley | Maine |
| | U. S. Gypsum Co. | Gypsum | Ohio |

**Division II—Remanufacturing**

| | | |
|---|---|---|
| Kimberly-Clark Corp. | Atlas | Appleton, Wis. |
| Container Corp. of America | Natrick | Massachusetts |
| Bemis Bro. Bag Co. | E. Pepperell | Massachusetts |

**IMPERFECT SCORES—Division I**

| | Key | Rank | Points Credit | Points Debit |
|---|---|---|---|---|
| GROUP A | PA- 2 | 1 | 863.088 | |
| | PA- 6 | 2 | 775.472 | |
| | PB-18 | 3 | 736.128 | |
| | PA- 9 | 4 | 735.968 | |
| | PA-11 | 5 | 632.768 | |
| | PA-14 | 6 | 434.224 | |
| | PA- 7 | 7 | 432.544 | |
| | PA-13 | 8 | | 4.400 |
| | PB- 6 | 9 | | 378.288 |
| | PA- 8 | 10 | | 1,299.696 |
| | PA- 5 | 11 | | 4,370.640 |
| GROUP B | PB-11 | 2 | 956.496 | |
| | PA- 1 | 3 | 926.528 | |
| | PB-21 | 4 | 863.664 | |
| | PB- 5 | 5 | 788.016 | |
| | PA- 3 | 6 | 719.008 | |
| | PB-14 | 7 | 687.840 | |
| | PB-22 | 8 | 575.568 | |
| | PA-12 | 9 | 445.536 | |
| | PB-20 | 10 | 425.648 | |
| | PB-19 | 11 | 381.152 | |
| | PB- 1 | 12 | 286.720 | |
| | PB-12 | 13 | | 236.736 |
| | PB-13 | 14 | | 258.640 |
| | PB-15 | 15 | | 687.152 |
| | PA-10 | 16 | | 1,769.088 |
| | PB- 3 | 17 | | 1,802.144 |
| | PB-17 | 18 | | 2,194.912 |
| | PB- 2 | 19 | | 3,251.792 |
| GROUP C | PC- 8 | 3 | 761.648 | |
| | PC-11 | 4 | 749.792 | |
| | PC-25 | 5 | 656.992 | |
| | PC- 9 | 6 | 643.440 | |
| | PD- 5 | 7 | 615.760 | |
| | PB-16 | 8 | 606.736 | |
| | PC-20 | 9 | 564.640 | |
| | PC-17 | 10 | 556.384 | |
| | PC-19 | 11 | 532.432 | |
| | PC-15 | 12 | 497.312 | |
| | PB-10 | 13 | 486.160 | |
| | PC-13 | 14 | 399.712 | |
| | PD-11 | 15 | | 195.216 |
| | PC-23 | 16 | | 393.152 |
| | PC-21 | 17 | | 401.856 |
| | PC-22 | 18 | | 754.448 |
| | PC- 7 | 19 | | 778.880 |
| | PB- 9 | 20 | | 1,446.400 |
| | PC-10 | 21 | | 3,602.432 |
| | PC-18 | 22 | | 5,579.264 |
| GROUP D | PD-12 | 6 | 888.896 | |
| | PD-16 | 7 | 769.856 | |
| | PD- 7 | 8 | 730.928 | |
| | PC- 4 | 9 | 723.232 | |
| | PD- 3 | 10 | 607.904 | |
| | PD- 8 | 11 | 587.232 | |
| | PD- 2 | 12 | 455.024 | |
| | PD-14 | 13 | 184.368 | |
| | PD- 1 | 14 | | 250.800 |
| | PD-15 | 15 | | 396.816 |
| | PD-10 | 16 | | 403.664 |
| | PD-13 | 17 | | 565.440 |
| | PD- 4 | 18 | | 830.720 |
| | PD-20 | 19 | | 1,285.376 |
| | PD- 9 | 20 | | 3,715.376 |
| | PD-21 | 21 | | 7,313.152 |

**DIVISION II**

| | | | |
|---|---|---|---|
| RD-1 | 4 | 763.072 | |
| RD-3 | 5 | 647.456 | |
| RB-3 | 6 | 595.904 | |
| RC-1 | 7 | 547.664 | |
| RB-1 | 8 | 507.968 | |
| RD-6 | 9 | 218.592 | |
| RC-3 | 10 | 213.776 | |
| RD-7 | 11 | | 146.768 |
| RA-1 | 12 | | 156.224 |
| RB-2 | 13 | | 211.728 |

Withdrawn: PA-4; PB-7, 8; PC-1, 2, 5, 6, 16, 26.
No June report: PC-14, 24; PD-23.

## ◆ Changes in Rules Govern New Safety Contest

The scores on this page are cumulative scores in THE PAPER INDUSTRY Safety Contest for the twelve-month period which closed June 30, 1933. The National Safety Council has published these scores as tentative statistics with the admonition that they must not be construed as announcing the group winners, nor as being final. All records will be carefully checked by the Council before a final report is

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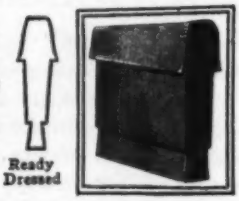


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## PULP

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## PAPER

published. As insufficient time in which to audit the statistics has elapsed since the last reports were received, the final report and the announcement of winners will not be made until the 22nd Annual Safety Congress in Chicago, October 2 to 6, 1933.

The new contest which began July 1, 1933, will run for one year. The final list of entrants has not yet been tabulated, but it is hoped this will reveal some new contestants in addition to all of the former ones.

The contest now in force will be governed by several changes in the former rules. The important changes occur in Rules 5 and 6(a), which are repeated as follows, the emphasis denoting that part of the rule affected by the change:

Rule 5—The winner of each group shall receive the National Safety Council award and shall be the mill receiving the greatest total number of points credit (or the least total number of points charged in the event there are no mills with credits) during the period of the contest, based on percentage reductions of both frequency and severity, as compared with the contest frequency rate of 25.00 and *severity rate of $3.00.*

Rule 6(a)—In the event that two or more mills are tied for first place in any group as of June 30, 1934 (See Rule 5), the winner of said group shall be the mill, among those tied, *working the greatest number of man-hours in the period of the contest.*

◆ ACCORDING TO Consul Arthur F. Tower, Mexico City, a market has been found in Mexico for two or three types of special expansion joint fillers. These were formerly imported into Mexico, but owing to an increase in the import duties, it has been ascertained that considerable use is now being made of locally made products. Rubberoid paper, roofing paper and Mexican asphalt appear to have been used extensively in connection with the installation of expansion joints. The demand for fillers of the above types has declined somewhat owing to the general depression, but it is expected that a revival of piping activities will occur as soon as an improvement in the economic situation is manifested.


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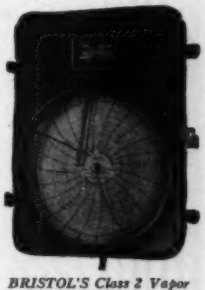

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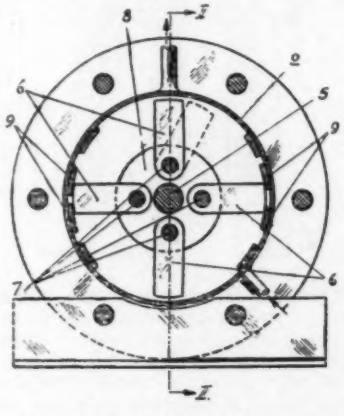
# TECHNICAL DEVELOPMENTS

## IN THE PAPER INDUSTRY ■ DOMESTIC AND FOREIGN

**The following abstracts are of the latest developments found in the foreign press and in the patent offices. Photostats and translations of complete articles and patents can be obtained at cost price.**

### ◆ Defibrinating or Grinding Wood

The wood is first cut into pieces about 25 mm. long (in the direction of the fibers) and about 12.5 long in other directions. The chips, with a moisture content preferably not greater than 60 per cent, are fed to a suitable vessel by means of a continuous conveyor. They are treated with steam in this vessel at a pressure of four atmospheres or more, but not below three atmospheres, depending upon the character of pulp desired. The temperature of the steam should be from 5 to 10 degrees greater than the temperature at which defibrination is to take place. The steam penetrates into the pores of the wood and condenses. Transmission of heat from the steam to the wood is



rapid and only twenty to forty seconds are required for this to take place. Defibrination or grinding is started as soon as possible after heating with steam, so as to avoid any unfavorable action of the high temperature on the wood fibers.

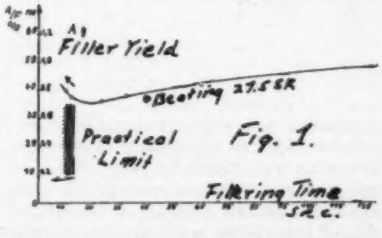
The apparatus used in the process of defibrination is shown in the accompanying illustration. It consists of a cylindrical chamber (2) with closed ends. Inside the cylinder is placed a device which can be rotated by external means. It consists of a main shaft (5) to which are fastened a number of movable vanes or blades (6) arranged on shafts (7) parallel to the main shaft (5), the former being fixed to plates (8). A number of bars (9) are arranged inside the cylinder (2) for the purpose of preventing the material from following the motion of the rotating device. The wood is thrown against the shell of the machine and then forced between the blades (6). The action of the machine is similar to that of a pulp mixing machine, the defibrination being accomplished by the friction of the wood and the blades (6) as well as the internal friction of the particles of wood. A. J. A. Asplund, Sweden. French Patent No. 737,037.

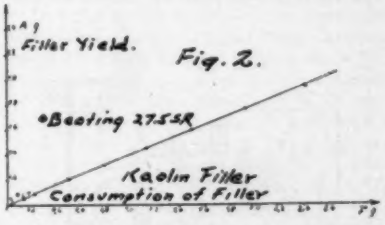
### ◆ Bleaching Pulp

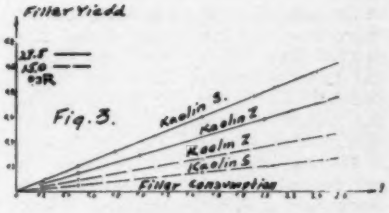
One thousand kilograms of air-dry pulp are fed along with water to a bleaching beater and heated to a temperature of 25 to 30 degrees C. The consistency of the stock is six to seven per cent. A calculated quantity of sodium hypochlorite bleach liquor (calculated on the consumption of chlorine required for the conversion of all the lignin into a state soluble in alkali) is added. After half an hour of bleaching a dilute solution of an acid salt is added, until a pH of 1 to 2 is reached. Then the mixture of chemicals and pulp is allowed to remain for one hour. Sufficient sodium carbonate is then added, so that the alkali content of the mixture becomes two per cent and the mixture is allowed to stand for an additional hour. The pulp is then washed. J. K. Glatz. British Patent No. 373,594.

### ◆ Fillers for Unsized Paper

The process of weighting paper with a filler is generally considered as an adsorption or a filtering process. Investigations have been made to show that in the case of unsized paper it is only a filtering process. There is strict relation between the consumption of filler and the amount actually retained by the paper fibers. A special method and apparatus was devised for carrying out the experiments. Various fillers used included different types of kaolin, china clay and three varieties of gypsum. Formulae were developed for the relation between the yield of filler from a sheet of paper, the consumption of filler and other factors. The influence of the speed of filtering of the filler on the yield was studied under the conditions of the experiments. Figure 1 shows the relation. The influence of the weight per square meter on the yield of filler was also determined experimentally. The relation between the yield of filler and the consumption of filler is shown in Figure 2 for a grade of kaolin within the limits investigated. These experiments were made with constant stock density and varying consumption of filler. It was found during the course of the work that it was impossible to keep the quantity of pulp exactly constant. It may be assumed, that as the quantity of filler added to the paper increases while the quantity of pulp remains constant, the pores become smaller and hence particles of smaller diameter are filtered than otherwise, and hence spontaneous filtration of the filler takes place. However, the yield with increasing loading of the paper with the filler, while the weight of the pulp web remains the same per square meter, must increase comparatively more than the consumption of the filler. The fact that this does not take place, as is shown by the straight




line curve in Figure 2, indicates that only the pulp is of moment for the formation of pores and the filler has no action in this respect.

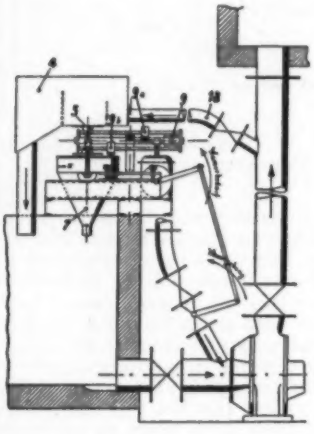
The experimental results are translated into practical operation of the paper machine. Change in the stock density, when the speed of the wire remains constant, causes a change in the weight of the paper per square meter. Examples are given to show how this relation works. If a definite ash content of the paper is required, then the consumption of filler must be adjusted to the density of the stock. Not only the density of the stock but also the changeable speed of the wire, which controls the duration of filtering, must be adjusted to the changeable suction effect in the suction boxes.

Additional experiments were carried

out on the size of the filler particle and its relation to the yield of filler and the filtering process. The white content and the size of particles of various kaolin fillers were also studied. Figure 3 shows the relation between consumption of filler and yield of filler for various kaolins. Dr. R. Lorenz and Dr. R. Stopp. Der Papierfabrikant, volume 31, pages 25ff.

### ◆ Stock Density Regulator

This regulator is of the type wherein a funnel is arranged on a balance arm and the stock flows through this funnel. Before regulation commences, the level of stock in the funnel for each density of the stock to be regulated is adjusted to the same height for each measured flow of stock, so that the balance arm is brought to equilibrium. The desired depression of the balance arm is then adjusted and then regulation begins. The container (4) which lies above the



funnel (7) in the stock inlet (18) and in the outlet (5) leading to the funnel, is provided with regulating valves. The balance arm which carries the funnel has three weights. These are first a non-shiftable weight (9) for equalizing the weight of empty funnel, a shiftable weight (9a) for the equalization of the varying weight of the filled funnel depending on the density of the stock and a second shiftable weight (9b) for adjusting the depression of the balance arm. F. Hassmann, Koetzschenbroda, Sa., Germany. German Patent No. 563,441, filed March 25, 1930.

### ◆ Permanganate for Pulp Bleaching

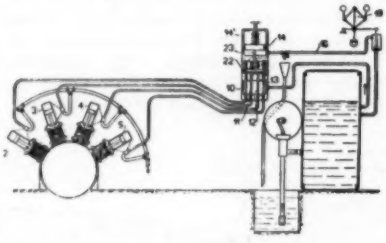
The following test is recommended for the determination of the bleachability of pulp by means of potassium permanganate. Two grams of the airdried pulp are worked up into a ball with eight grams of water. The ball is placed in 470 cc. of water in a one liter flask and stirred thoroughly. Then 22 cc. of approximately normal solution of sulphuric acid and 50 cc. of tenth normal solution of potassium permanganate are added. The flask and its contents are then allowed to stand for exactly sixty minutes with occasional stirring. Thereafter 50 cc. of tenth normal solution of ferrous-ammonium sulphate are added and the mixture filtered to obtain a 100 cc. liquor portion. 900 cc. of water and 10 cc. of normal solution of sulphuric acid are added and the mixture is then titrated with tenth normal solution of ferrous-ammonium sulphate. The percentage of potassium permanganate consumed is calculated on the weight of the dry pulp. The results which are found by this method are claimed to agree with those that are obtained in practice. E. Wathelet and L. Remacle. Moniteur Papeterie Belge, volume 13, 1933, pages 27 to 31.

### ◆ Digestion of Pulp

The hot liquor, used in the digestion, is fed into a stationary digester under pressure. The digestion liquor is heated under such pressure, that it can attain a temperature in excess of 100 deg. C. without undergoing decomposition. The liquor is heated in a continuous flow under pressure in a preheater. It is then fed under pressure into special tanks, where it is stored and from which it is withdrawn as needed and fed to the digesters. During the preheating and storage of the liquor separation of sulphur dioxide and lime must be avoided. This is attained by maintaining a comparatively high pressure while the liquor is in the preheaters and the collecting tanks. W. Pulz, Bruenn, Czechoslovakia. Czechoslovakian Patent No. 40,173.

### ◆ Woodpulp Grinder

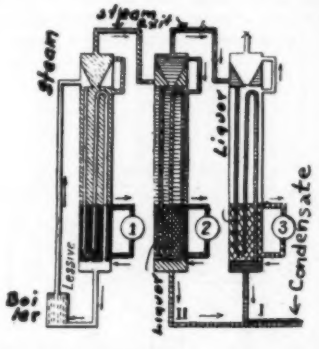
The grinder is provided with a number of pockets, as seen in the accompanying illustration. The arrangement is such that variations in the power fed the motor or other prime mover, which drives the grinder, are carried over only to one of the pockets, while the remainder of the pockets, which are at certain times connected into the regulator circuit, remain unaffected by these power variations. A regulating member (1), (11), (12) and (13) is connected with each of the pockets (2), (3), (4) and (5) respectively for the purpose of controlling the pressure of the fluid acting on the pistons. These



regulators are actuated by a common control. This is the piston (14) which moves in the cylinder (14′). This piston is under the influence of the compressed fluid, which acts on the underside of the piston, entering the cylinder (14′) through the pipe (16). Thus the piston (14) is raised and with the aid of plate (22), which is connected to the piston (14) by means of the rod (23), the regulating members (10), (11), (12) and (13) are opened one after the other and load placed on the corresponding pockets. Actuation of the common piston control (14) is accomplished by the load regulator (19), depending on the energy fed from the driving motor to the grinder. For example, if this is sufficiently great so that all the pockets of the grinder can operate under full load, then the plate (22) actuates all the controlling devices for the pockets. On the other hand, if the available energy decreases for one reason or another, the piston (14) moves more or less downward and closes the regulating members one after the other from (13) to (10), with the result that the press pockets (5), (4), (3) and (2) are put out of operation in succession. M. Wolf, Anger b. Weiz, Austria. German Patent No. 569,388, filed November 6, 1930.

### ◆ Digesting Pulp and Concentrating Black Liquor

The principle of the Albenielsen evaporator consists in evaporating a part of the water from the liquor during digestion in one and the same apparatus. Digestion takes place indi-

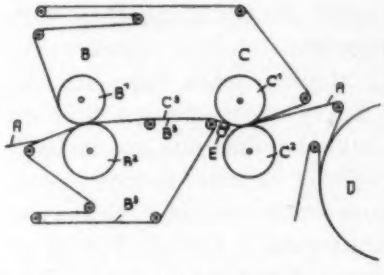



rectly with circulation of the liquor. Two or more evaporators, each having a boiler, are arranged in series so that each evaporator is heated by the vapors from the preceding mass of liquor. When boiler number 1 is ready, the system of evaporators is displaced one unit to the right, number 3 becomes number 2, number 4 number 3, and so on. In these evaporators only the first unit comprises a closed circuit. There is a coil in this evaporator through which steam from the boiler flows, affording the initial heat for the system. The other evaporators are provided with circulating coils of discontinuous type. The concentration of the liquor increases from one stage to the other, increasing from 16 degrees Be. in the first evaporator to 24 degrees Be. in the last. The level of the liquor in the evaporator is regulated by the temperature of the hot walls and by the pressure of the vapors. At a temperature of 130 deg. C. the disintegration of the wood and the digestion of the cellulose contained in it become exothermic, due to the combination between the alkali and the cellulose. Evaporation of the liquor starts at this point. It is claimed that

black liquor, which is evaporated by this process, does not have a tendency to foam and does not cause incrustations on the walls. R. Blomvik. Papir Journalen, volume 20, pages 119 to 121, 129 to 134, 139 to 143, 151 to 153 and 160 to 163.

### ◆ Wet Press Arrangement in Paper Machines

A new arrangement of the wet presses on paper and cardboard machines has been devised for the purpose of obtaining products with both surfaces as smooth as possible. The usual arrangement of the rolls, in which the inelastic rolls are placed above the rolls provided with an elastic covering, is reversed in a part of the machine and the rolls with elastic covering are placed on top while the hard rolls lie below and thus come in direct contact with the paper web. Hence the undersurface of the paper, which has the wire marks and the felt marks contacts with




the hard polished surface of the rolls. The accompanying illustration indicates the arrangement of the rolls. The paper web is shown at (A). It has a smooth top-surface, while the undersurface is impressed with felt and wire marks. The paper web runs through the regular wet press (B), the upper roll of which ($B^1$) is made of stone, cast iron or the like and the lower roll of which is covered with rubber, shown at ($B^2$). The paper is carried by a lower wet felt ($B^3$). In the new press (C), the upper roll ($C^1$) is covered with an elastic covering, rubber felt or the like, while the lower roll ($C^2$) is made of a hard, inelastic, polished material, such as stone, cast iron, or the like. A lower felt is not provided. The top felt ($C^3$) runs through both presses. Air, which is emitted from the nozzles (E) against the paper web, is used to carry the paper over. J. M. Voith, Heidenheim, Brenz., Germany. German Patent No. 560, 106.

### ◆ Rosin and Rosin Size

Difficulties in research on rosin and rosin size are assigned to the fact that rosin is a natural product and is subject to sharp variations in composition. The various constituents of rosin are discussed. The problem of using European rosin in the place of American rosin is also considered. It is claimed that the yellowing action of rosin size in sizing fine papers may be overcome by hydrogenation to form dihydro and tetrahydro-abietic acids. Hydrogenation is accomplished under high pressure in the presence of suitable catalysts. The use of colloid protectors in making the rosin size is recommended. The nature of the colloidal substance added depends on the character of the paper sized. Water glass is used for this purpose, being added directly to the beater. High molecular weight colloids should only be used and should be added to the size during the cooking process. The effect of the colloid, which is added separately from the size to the pulp, is quite different than when it is worked up with the size itself. The amount of rosin size absorbed in the paper is increased 25 to 30 per cent and more when the colloid is added. Dr. E. Semelbauer. Der Papier Fabrikant, 1933, volume 31, pages 187 to 189.

### ◆ Reworking Old Paper

The feature of this process for removing ink from printed paper, particularly newsprint, is that the active de-inking reagent is used in low concentration only and that its chemical properties are such that the fibers are not injured in any way and therefore retain their strength while being converted into a pure white state. This result is attained by immersing the newsprint in seven times its weight of cold water containing in solution about one-half per cent of a saponified, sulphonated or untreated fatty substance, and about one-half per cent of solvents, which remain in perfect dispersion in water in the presence of soap. The de-inking proper is accomplished by mixing the macerated paper after the addition of a large quantity of water, with a little solvent whose density is greater than that of water and which, therefore, sinks to the bottom of the tank with the separated ink. The mixture that is used in carrying out this process consists of a soap, such as ammonium oleate, and solvents, such as carbon tetrachloride, carbon disulphide or other chlorinated hydrocarbons. The duration of the treatment is about twenty minutes. In order to remove the black separated from the fiber, the pulp is worked up in a beater or similar apparatus. The pulp is diluted in this operation with seven to twenty times the weight of water. Fernand F. Schwartz, Switzerland. French Patent No. 739,533.

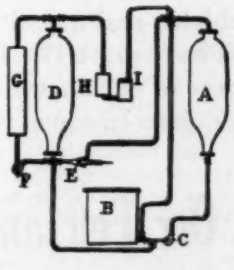
### ◆ Sulphite Process

Experiments were carried out in the same digester to determine possible variations in the speed of reaction and the degree of digestion of the stock. Eight digestions were made. The first digestion was carried out in the usual manner with the usual degree of digestion. The steam consumption and steam pressure curves were obtained. The steam valve and the relief valve were regulated by the operator in such a manner that the pen of the registering instrument was allowed to run along the curve as registered before. Hence not only the same quantity of steam and hence the same quantity of heat was added to the digester in each digestion, but the duration of digestion was also maintained the same. While the wood chips were being charged into the digester, 24 samples were taken and tested for temperature and water content. Steam consumption for the charging apparatus was measured and the time of charging was noted for each digestion. The time for filling the digestion liquor into the digester was also fixed. Superheat and steam pressure were measured every five minutes on the steam line. The digestion acid was analyzed and the temperature of the same measured. The effect of external temperature was not considered, as the masonry work of the digester was 14 centimeters thick, and it was also provided with eight centimeter insulation. The heat remaining in the digester shell from previous cookings was disregarded, since the eight digestions were carried out one after the other and it is assumed that the same quantity of heat was added in each case.

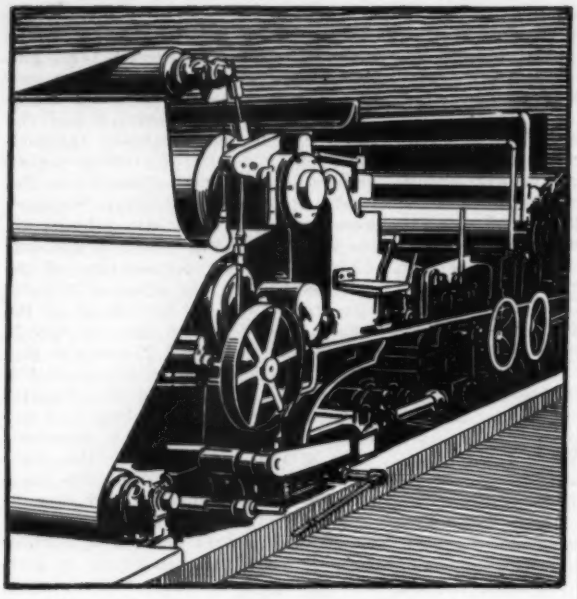
In spite of the care taken to maintain conditions constant, small irregularities crept in which did not permit an accurate comparison. The water content of the wood chips varied only 1.9 per cent. Differences of about 3 degrees C. were noted in the steam temperature. Differences in the composition of the digestion liquor were small, about 0.2 per cent in the sulphur dioxide content and a few hundredths of a per cent in the CaO content. The experiments were continued until the exact initial conditions were obtained in two, that is the sixth and eighth digestion. In these two experiments the greatest difference in the speed of reaction was observed, since digestion number 6 required one hour 55 minutes more time than digestion number 8 in order to obtain the same degree of digestion in the pulp. Karl Hennefeld. Der Papierfabrikant, volume 31, pages 38 to 40.

### ◆ Sulphite Cellulose Process

The digestion acid, which has come in contact with the wood at the normal temperature and which has been thereafter heated, is fed from a hot pressure tank (D) to a digester filled with wood and cold fresh digestion acid. The di-




gester is shown at (A). The cold fresh acid is recirculated and mixed with the hot acid. The hot acid liquor partially mixed with the cold acid liquor is recirculated into the pressure tank and the wood is then digested in the ordinary manner with the hot acid. C. A. Geijer. Swedish Patent No. 74,897, filed August 22, 1927.



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# The COMMERCIAL OUTLOOK

New York, August 1, 1933.

GRADUALLY the paper industry is being adjusted in accordance with the terms of the New Deal. The industry has drafted its code of fair competition, which will be submitted shortly to the Recovery Administration in Washington, and a Paper Industry Authority has been set up within the industry to administer the code when it is approved and adopted. Principal provisions of the paper and pulp code are a rise in payroll levels of about 40 per cent and an immediate increase in employment of at least 20,000 persons. Thus, the industry through its code is subscribing to the primary purposes of the Government in raising wages and increasing employment.

Meantime, the market for paper of practically all kinds is showing consistent and appreciable improvement. Demand during the last few days of July has shown a little slowing, due to circumstances outside rather than within the paper industry itself. The sudden slump in security and commodity prices lately, coming at just the time when the various industries were busily occupied in compiling their codes of practices, had its influence on paper business, and resulted in a temporary quieting of the market. However, a majority in the trade view the halt to the sharp rise in prices generally as a good thing, since it is believed to have been a natural reaction to the broad advancement in the various markets during the last three months. The feeling is common among paper manufacturers and distributors that a market of far wider scope and characterized by much greater activity than has yet been seen will be witnessed in the fall and early winter.

In fact, optimism is running high within the industry regarding business prospects. The country at large has rallied to President Roosevelt and his Administration in their concerted efforts to revive industry and trade by putting people back to work, raising wage levels and in general bringing the buying power of the country back to where it was in the prosperous 1929 days. There seems every reason to expect that several millions of workers will be back in jobs by Labor Day—the Recovery Administration in Washington has made the estimate that 6,000,000 will be reemployed by that date—and this huge return of unemployed to earning capacity can only mean a tremendous gain in buying power. It is needless to say that if general business improves to the extent that is anticipated, paper business will increase in full proportion because paper consumption and demand are dependent on all the other industries—virtually every industry and every individual being a consumer of paper of most all classes.

The salient feature of the paper situation during the last month has been the ability of manufacturers to get together and cooperate in readjusting prices of their product on higher levels in keeping with fairly drastic upward changes in raw material and other costs. Cooperation has been preached within the industry for years, and of course there has been some degree of cooperation in certain divisions of the industry before now, but it can be said that the past few weeks have witnessed the inauguration of a new era for the industry from the standpoint of manufacturers working together in effecting changes and improvements necessary to keep pace with these momentous times. There are groups of paper manufacturers now solidly organized and smoothly functioning in reestablishing prices on advanced levels, and the result is that market prices of the various kinds of paper are well adjusted to the higher costs of production.

Some of the advances in paper prices have been substantial. In book paper, for example, there have been three broad jumps in mill quotations, bringing the basis on machine finished book up to around 4.75 cents per pound on a delivered basis and representing a rise of more than one cent a pound from the low level prevailing several months ago. Kraft wrapping has been advanced to where No. 1 southern kraft is fetching 3.50 cents a pound, also an appreciable rise. Sulphite bonds and ledgers have moved up sharply in price, while tissue, manila, fiber and other papers are quotably higher, and boxboards have registered marked price gains. Plain chipboard is quoted in the East at $40 per ton and filled newsboard at $42.50 on a delivered New York basis. An outstanding feature of the price situation is that all mills are adhering firmly to the quotations named. Practically no digression is noted in any quarter; it has been many a day, if ever, that manufacturers are sticking so steadfastly to the market levels obtaining and refusing to even so much as consider the granting of price concessions. This in itself is stimulating demand because consumers and converters are being encouraged to buy.

Paper mills are proceeding cautiously in booking orders for forward delivery. As a matter of fact, manufacturers are purposely and boldly doing what they can to discourage buying ahead by paper jobbers or distributors. Most mills —it can be said practically every mill —are refusing flatly to accept business for future delivery except on the basis that price be left open to be determined at the time shipment is made. In short, in view of the uncertain position of raw materials and the strong likelihood that costs of same will undergo further rise, manufacturers are guarding against being caught "holding the bag" for their customers should market price levels move higher. The adoption of this policy by mills has held buying by paper merchants and converters in check, and should mean that demand in the months to come will continue on a fairly even keel.

Production of newsprint in the United States in June amounted to 84,384 net tons, compared with 79,516 tons in the preceding month, while shipments from mills were 87,359 tons, against 77,196 tons in May, according to the News Print Service Bureau. Canadian production during June was 171,419 tons, contrasted with 171,776 tons in May, and shipments totaled 171,678 tons, against 165,520 tons in May. During June, 20,672 tons of newsprint were manufactured in Newfoundland and 1,396 tons in Mexico, so that the total North American production for the month aggregated 277,871 tons. The Canadian mills produced 104,649 tons less in the first six months of 1933 than in the same time of 1932, a decrease of 10 per cent. The output in the United States was 86,492 tons or 16 per cent less than for the first six months of last year, in Newfoundland 16,162 tons or 12 per cent less, and in Mexico 1,806 tons more, making a total decrease of 205,497 tons or 12 per cent. Production by United States and Canadian mills combined in the first half of this year amounted to 1,350,683 tons, against 1,546,642 tons in the similar period a year ago. Shipments were 1,351,419 tons, contrasted with 1,544,742 tons in the first six months of 1932. Stocks of newsprint paper at Canadian mills at the end of June were 43,068 tons, and at United States mills 21,964 tons, making a combined total of 65,032 tons, against 68,266 tons a month before.

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## ◆ Vanillin From Sulphite Waste Liquor

Experimental study was made of the conditions affecting the yield of vanillin from sulphite cellulose waste liquor. It was found that the yield of vanillin obtained in the alkaline, pressure cooking of sulphite waste liquor remains the same; when, instead of adding sodium hydroxide directly, a mixture of sodium carbonate and carbon dioxide, stochiometrically equivalent to sodium hydroxide, is used. This conclusion is of considerable importance in view of the high consumption of sodium hydroxide in the production of vanillin by this process. Karl Kuerschner. Technologie und Chemie der Papier und Zellstoff Fabrikation, volume 30, pages 1 to 2, 1933.

# Domestic RAW MATERIALS

### ◆ Papermaking Rags

There are indications that prices of papermaking rags, after scoring sharp increases in nearly all grades, are now leveling off, gaining more stability and in certain instances tending in favor of consuming buyers. In at least one division of the market—in roofing stock—there has been a slight easing of prices in some production centers. It would appear as if the situation is now righting itself following a period in which market values on some classes of rags advanced with a rapidity perhaps never before witnessed.

At the same time, there is no denying that the rag market condition is inherently strong, more particularly from a supply standpoint. There is no sizeable accumulation of papermaking rags, of any grade or in any part of the country. The fact simply exists that during the last three or four years, in the stress of the times, clothing has been worn longer than ordinarily, so that fewer old rags have been produced; furthermore, clothing, shirt, hosiery and other factories have not operated at anything approaching normal schedules, with the result the output of new cuttings has been reduced materially. Also, the low market prices which prevailed for rags for a lengthy period served to discourage their conservation and collection—many collectors forsaking the industry because of being unable to eke out a living in gathering rags. The effect of these circumstances is that the market at present is bare of accumulations of rags; that this is true has been proven by the record-breaking rise in prices recently when demand from consuming quarters registered an increase, and but a moderate increase.

New cotton and linen cuttings have not advanced in market value in like proportion to some of the old rags used by papermakers, notably roofing rags, and dealers and packers are holding stocks of cuttings at firm price levels. Additional advances have been recorded in some descriptions of cuttings but the uptrend at the moment seems checked at least temporarily, and sellers appear more willing to accept orders than they were provided they receive prices which they feel constitute full market values. No. 1 new white shirt cuttings have been sold to paper mills at 7 cents a pound delivered, and perhaps in certain instances at this price on a f.o.b. shipping point basis, while new unbleached muslins are quoted firmly by dealers at 7.25 to 7.50 cents at shipping points, light silesias at 4.50 cents, fancy shirt cuttings at 2.50 to 2.75 cents, No. 1 washables at 2.25 cents, blue overall cuttings at 4.25 cents, bleached canton flannel at 6.25 cents, black silesias at 2.75 cents, white linen cuttings at 10 cents, and gray linen at 8 cents.

Roofing rags are selling in the East at a cent per pound to a shade more for No. 1 domestic classification roofing stock, and 85 cents a hundred pounds for No. 2 roofing.

### ◆ Old Paper

Further rise has been noted in prices of some of the better grades of old paper, though the additional increases have been comparatively slight, while the low or bulky grades have become fairly well stabilized on levels attained by the market sometime ago. The tone of prices is firm, even though not many advances have been registered in the recent past. Reports tell of pronounced strength in white shavings, particularly in the East, where sales of soft white shavings have been made to mills at 2.25 cents a pound f.o.b. shipping points, of one-cut soft shavings at 2.50 cents, of No. 1 hard white shavings at 2.35 cents, and of No. 1 hard white envelope cuttings at 2.75 cents. Old books and magazines have brought 1.10 cents a pound f. o. b. New York, representing a price increase, and ledger stock has risen to 1.30 cents a pound for white and 1.15 cents for colored at dealers' shipping points. Old kraft paper is bringing 1.20 cents a pound f. o. b. dealers' points, white news blanks 1.40 cents, old corrugated boxes 85 cents per hundred pounds, folded news 80 cents, and No. 1 mixed paper 75 cents. These prices vary to some extent, depending on the location, though the supply condition East and West is strong and dealers are not in a mood to grant concessions.

### ◆ Pulpwood

Demand of fair dimensions is reported for pulpwood and prices exhibit a stiffening trend. Most of the pulpwood traded in the open market originates in Canada, and rising exchange is having the effect of pushing prices of the commodity upward, aided of course by fairly active buying by pulp manufacturers.

### ◆ Rope and Bagging

The rise in prices of foreign old rope, due to advancing exchanges, has served to shove market levels of domestic old rope upward also, and prices have climbed a little more. Sales of No. 1 old manila rope have been made to paper mills at up around 2.85 cents a pound f. o. b. shipping points and ex-dock American Atlantic seaboard, although it is said the prices offered by the leading paper mill purchasing agency are but 2.50 cents for domestic and 2.25 cents for foreign old manila. Bagging prices are firm to strong, and here too foreign exchanges rising in relation to the American dollar have aided the upmove in the market. No. 1 scrap bagging is bringing 1.20 cents a pound at shipping points, and it is very likely sales have been made at beyond this level, especially when imported stock has been concerned. No. 1 gunny is about 1.40 cents for domestic at shipping points, and several dollars per ton above this price for the imported article. Roofing bagging is selling at 80 to 85 cents per hundred pounds at dealers' points in the East.

### ◆ Mechanical Pulp

Wood pulp of all classes has shown additional price gains, and groundwood has shared in the advance. Very little mechanical pulp of domestic make is available in the market currently; in fact, it is said almost no offerings are being made by producers, nearly all of whom are themselves using all the groundwood they are manufacturing. Canadian groundwood is bringing around $25 a ton delivered American paper mills, prices varying to a slight degree depending on the haul from producing to consuming centers and the air dry test. Canadian pulp brought down by schooner to New York and other American ports is quoted at $23 to $24 on the Atlantic seaboard.

### ◆ Chemical Pulp

The outstanding feature in the domestic chemical pulp situation is the reluctance exhibited by producers to sell. This may sound strange and may be viewed as an exaggeration, but it is a fact that domestic manufacturers are not a bit eager to book orders for sulphite pulp at the market prices now prevailing. The obvious reason for this is that higher prices are expected. Domestic producers feel that the sharp rise in European currency exchanges will lead to further increases in foreign pulp prices, and that domestic pulps will advance along with the imported product. Therefore, having sold fairly heavily for the remainder of this year and satisfied to wait out the market while believing prospects are all in their favor, manufacturers are not over desirous of additional orders at present. Some domestic producers are naming 3 cents a pound f. o. b. pulp mills or ex dock Atlantic seaboard for bleached sulphite and are refusing to sell at less; it is doubted much such pulp is to be had under this price level, and many of the extra quality brands run well above this price. Unbleached sulphite is quoted 1.70 to 2 cents per pound at pulp mills, bleached soda pulp at 2.25 to 2.50 cents delivered paper mills, and domestic kraft pulp on a range of 1.50 cents at pulp mills for southern up to 2.25 cents and higher for eastern kraft.

### ◆ Chemicals

Papermaking chemicals are quotably firm. Bleaching powder is moving freely on a contract basis of 1.75 to 2 cents a pound f. o. b. works, while caustic soda is quoted at 2.55 cents upward for the solid product at works, and soda ash at 1.30 cents a pound in bags at factories. Domestic casein is around 13 cents a pound, according to the grind, and imported approximately a cent higher.

# Import and Export MARKETS

## IMPORTS

### ◆ Wood Pulp

Further rises in European currency exchanges have led to additional increases in prices of imported wood pulp. Compared with a month ago, prices of chemical pulps, or the three principal classes of such pulp—bleached sulphite, strong unbleached sulphite and unbleached kraft pulp—have climbed another $3 to $5 per ton, and it would appear as if the end of the advance has not yet been seen. However, in the recent past the market has displayed something of a leveling off process; the sudden downtrend in commodity and security markets, accompanied by at least some decline in foreign exchanges against the American dollar, appears to have held in check for at least the time being any further rise in pulp prices. Nevertheless, the tone at the moment is firm indeed; producers in Scandinavia and elsewhere in Europe are anything but eager for additional orders at prevailing market levels, while demand is fully ample to absorb all the pulp offered, and predictions are being made by those on the selling side of the trade that more and perhaps sharper advances will be witnessed in pulp prices before the close of the current year.

Bleached sulphite quotations have stiffened to where it is reported very limited supplies of strictly prime bleached are available at 2.50 cents per pound ex dock New York or other American Atlantic ports. Most sellers are asking 2.60 or 2.65 cents and higher, and quotations on half-prime bleached frequently range up to the 2.50 cents level. Prime strong unbleached sulphite has been sold at 2 cents ex dock Atlantic seaboard, and this is now regarded as the market basis, although it is likely some purchases are still feasible at a little under this price or $1 to $2 a ton less.

Buying by American paper and board manufacturers has been on a broad scale. Evidently sensing that pulp prices were bound to rise, consumers flocked into the market and placed orders for sizeable tonnage, some covering their requirements fully, insofar as can thus far be judged, for the remainder of this year. The result is that pulp mills on the other side of the Atlantic are now in a position of having restricted amounts of their product for sale over the next few months; in fact, a good many are completely sold up for 1933. This is no idle statement; ample proof has been gained recently that some European mills have no more pulp to sell this year, as cabled bids at full market prices have been refused and have elicited emphatic assertions that the pulp desired would not be obtainable even at appreciable increases over ruling market levels.

American consumers therefore are faced with the possibility, if not probability, that should consumption in the United States continue to mount, and paper manufacturers find this fall or early winter that their requirements called for more pulp, a demand and supply situation may develop which would result in a runaway market. The fact should not be lost sight of that European sulphite mills are working under an iron-bound agreement to keep their production down within certain percentages of output in previous years, and that should world demand expand to where they could market a good deal more of their product, they cannot under their agreement increase their production during the balance of this year.

It is the contention of members of the trade that the price advances in pulp have done nothing more than to offset the rise in European exchanges against the dollar. In short, it is declared that the higher market prices now prevailing in the United States mean naught else to pulp manufacturers across the Atlantic than to equalize money values since the dollar started dropping and sterling and other European currencies began climbing.

Imports of pulp into the United States in May registered a gain over the preceding month, and were also well above the receipts in the same month last year. Total importations of chemical pulp in May amounted to 73,376 long tons, valued at $2,571,535, according to official U. S. Department of Commerce figures, compared with 55,722 long tons of a declared value of $2,097,085 in April this year and 59,424 tons of a value of $2,348,666 in May a year ago. Imports during the first five months of the current year aggregated 411,537 long tons, valued at $14,525,048, contrasted with 536,167 tons of a value of $20,905,835 in the corresponding period of 1932. Groundwood imports in May were 16,146 long tons of a value of $253,590, against 7,097 tons of a value of $131,296 in the preceding month, and for the five months this year totaled 43,661 tons of a value of $738,490, compared with 67,447 tons of a value of $1,391,164 in the similar time of 1932.

### ◆ Paper Stock

May imports of papermaking rags into the United States reached 6,008,327 pounds, valued at $30,756, according to U. S. Department of Commerce statistics, showing a gain over the 4,373,351 pounds of a value of $26,344 in the month before, and bringing the total for the first five months of this year up to 23,653,376 pounds of a value of $168,579, compared with 41,411,346 pounds of a value of $537,784 in the corresponding time last year. Imports of miscellaneous paper stock in May were 6,817,755 pounds, valued at $65,290, making a total for the first five months of the year of 28,489,845 pounds of a value of $275,741, against 44,125,747 pounds of a value of $362,115 in the same period of 1932.

### ◆ Paper

Imports of paper into the United States recorded an appreciable increase in value during May as contrasted with the preceding month, reaching a total of $6,890,913, compared with $5,867,650 in April, but were below the $9,293,794 worth of paper imported in May, 1932. Imports during the first five months of 1933 were valued at $28,216,842, against $42,404,630 in the same period a year ago. Standard newsprint comprised the bulk of the May, 1933, imports, amounting in value to $6,182,719, with cigarette paper of a value of $280,812 the next item.

## EXPORTS

The United States succeeded in extending its exports of paper to a slight extent in May as compared with the preceding month. The May exports of all kinds of finished paper and paper products were valued at $1,102,063, according to U. S. Department of Commerce figures, against $1,052,357 in April this year and $1,426,944 in May, 1932. Exports in the first five months of the current year reached a value of $5,410,893, contrasted with shipments valued at $7,153,681 in the corresponding time a year ago.

Newsprint exports in May were valued at $30,503, compared with $38,887 in the same month of 1932, while uncoated book paper exports were of a value of $50,707, against $125,880 last year, and wrapping paper shipments were valued at $73,460, against $89,013 in May last year. Writing paper exports in May reached a value of $69,979, against $109,979 in the similar month a year ago. Paper bag exports were valued at $44,592, against $47,749 last year, and paper boxes at $38,034, compared with $58,694 a year ago. Exports of boxboard were of a value of $120,418, against $43,649 last year, and of other paperboard $50,954, contrasted with $82,961 in May, 1932.

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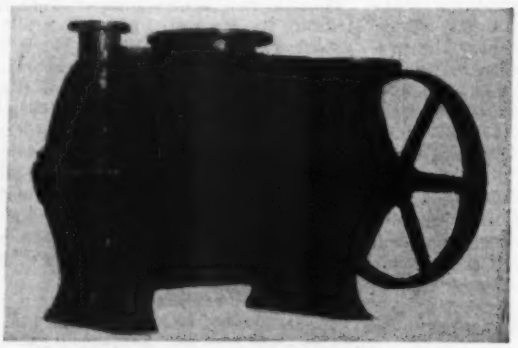

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